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EDITORIAL NOTES—GAS, &c.

Surface Combustion and High Efficiency Heating.

THE lecture theatre of the Royal Institution of Great Britain has been the scene of the public introduction of many discoveries that have made a vast impress upon knowledge and upon the affairs of the world and of mankind generally; but it has never witnessed the introduction of a development that has been loaded with so much potentiality for the gas industry—more particularly in relation to the industrial uses of gas—as that of the surface combustion of gaseous mixtures, at which Professor Bone has been working for certainly the last eight years or so, and for many months past with Mr. C. D. M'Court, a very valuable collaborator. Professor Bone picked up the work those few years since where it was laid down by *savants* of the early part of last century. From their antagonistic beliefs, he selected the starting-ground for prosecuting the work; and by sheer persistence he has brought it to a stage where, it is firmly believed, it links up to our austerely practical industries the means of effecting fresh economies and fresh efficiencies. We need not here dwell at any length upon the reason for the long neglect of surface combustion by technical men. But this neglect was undoubtedly primarily due to the influence of Mr. Frederick Siemens, who on this particular point, it is obvious now, went astray and thus misled others. This shows how dangerous it is for practical men to accept unreservedly the *dictum* of any single investigator, however influential or eminent. Siemens grasped the significance of radiation in industrial heating operations; but his views about flame and the mechanism of combustion Professor Bone (it is clear from his first lecture) holds were decidedly crude. To return, however, to the demonstration by Professor Bone and his associates, at the Royal Institution last Thursday, of the serviceability of two methods of realizing surface combustion. At its close, there was only one feeling among those present. It was that what had been seen was only the threshold to, from the standpoint of observation to-day, infinite possibilities. It is another victory for those who search scientifically for the hidden treasure which exists in natural forces, and which, when discovered, can be applied to the requirements of the life and the work of the world. Is it to be that the relation in which the incandescent mantle stands to the economy and the efficiency of lighting, is to be symbolized in the relation of the surface combustion of gaseous mixtures to the economies and efficiencies of heating—at any rate, in industrial service?

Most of those in the gas industry who study the technical progress bearing upon its fortunes, know what is meant by surface combustion, and that the practical applications comprehend at the present time two methods of attaining the acceleration or quickening of combustion that forms the fundamental part of the new system. But it is only those who have seen the effects who have any clear perception of the real thing. There are points, however, that need not be seen to be appreciated. One of these is this: By the use of a gaseous mixture—the proportion of air being slightly in excess of the theoretical quantity required for complete combustion, and the air at a slight pressure—with the combustion proceeding at the surface of a porous refractory material, or in contact with the surfaces of granules of refractory materials, temperatures can be obtained at will that are only confined in the upward direction by the limits of the durability of the known refractory materials. After eight years' work upon the subject, Professor Bone has to confess that he has no knowledge of what are the temperatures on the higher scale of which the new process is really capable. The extent to which he is able to go is to say that, using a bed of carborundum, he has converted the surfaces of the nodules into carbon dioxide and silica, which proves that he attained a temperature approaching 2000° C. But we need not at the present time trouble much about these exceedingly high temperatures. It may be taken that the range of utility as measured by the heat resistance of present commercial refractory materials is sufficient for the day in the matter of work and usefulness. A stage has been reached at which, for all industries that require radiant heat, uniform, variable in degree at will, and reproducible, for any purpose, or a high degree of efficiency in the matter of heat transfer from the heat source to whatever is being heated (for example, the water in a steam-boiler), Professor Bone and his collaborators say they have a system that has emerged from the experimental stage, and is ready to be adapted to practical service. The adaptation has commenced. Where it is going to end is a matter upon which no one can speak definitely.

It would be useless to attempt any digest of the evidence so freely produced at the demonstration, because the report we are publishing in our pages to-day of the oral statement that accompanied the display will be read, far and wide, from beginning to end; and the full import of this scientifically founded invention will be gathered from what appears in it. There are, however, a few points on which further remark may be made. There is the question of the economy of the system. Efficiency and economy are synonymous terms in this as in other connections. The fullest information upon this point will be found in connection with the investigations and actual trials that have been made by applying the system to the raising of steam in a ten-tube boiler. The close approximation of the quantity of heat transferred to the water in the boiler to the thermal value of the gaseous mixture fed into the granular packed tubes of the boiler is such that the onlooker can only marvel and applaud. The attendant economies, apart from mere fuel costs, are equally remarkable. Time to the manufacturer represents money. And when steam can be raised in large volume and at high pressure, starting cold, in a space of time to be measured by a comparatively few minutes, there is an economy in that. Further, in the revolutionizing effects on the structural arrangements of a boiler-house and on the boiler itself by the application of the system, there must be a direct money economy of a very substantial order.

With regard to other applications so far demonstrated, there is not yet as much figured information available as in the case of the steam-boiler. But in all the processes so far developed, there has been demonstrated the rapidity of attaining high temperatures, with which, it is held, the ordinary flame methods cannot compete in time, degree, or uniformity, or in the rapidity of the execution of work. If this is all proved in daily practice to be the case, there is economy for the user. There is the question of the wear and tear. All the arrangements are remarkable for their simplicity. Beds of granular refractory material are not costly. The porous diaphragms for radiant heating are of a selected texture for their particular work, and for the character of gas used and pressure required; and, again, their granular elements held together by cementitious means do not represent anything costly. In continuous trial work, they have had a proved life of several months. The fear as to the blocking of the pores of the diaphragms has proved groundless. In their use, there is no flame. Combustion proceeds in the highly incandescent surface of the diaphragm. In such a surface, any foreign substance that there may be in the gas is completely consumed. To pass from the economical and the wear-and-tear considerations to one other. In this method of heating, the proportion of air to gas is higher than is theoretically required for complete combustion. To maintain the perfect incandescence of a diaphragm, there is no claim upon the external air; and this was proved by placing an incandescent diaphragm with

its mixing chamber in a vessel charged with carbon dioxide. Though the flame of a taper, on immersion in the carbon dioxide, was immediately extinguished, the incandescent surface of the diaphragm remained unimpaired.

Those who ridiculed the idea of surface combustion when Professor Bone first revived interest in it with all the assurances of long investigation and practical trials to support him, must now be silenced by the invincible fact of proved success. Surface combustion has come to stay among the things of practical utility. The measure of application must be left to be divulged by the accretion of successful working under the stern routine operating conditions of the manufactory. But what of the gas industry? Is this for it a fresh opportunity? If so, Professor Bone and his associates in this development have added a very solid argument to all that has gone before for the production and sale of British thermal units at the lowest possible price.

Coke-Oven Gas for Town Supply.

The revival of the question of the utilization of coke-oven gas for town supply is being stimulated from various quarters; and more serious attention is being directed to the matter than on previous occasions when it has been brought to the surface. With the considerable experiences of America before them, and with towns under supply so near as the Rhenish-Westphalian industrial district, those interested in the disposal of the residual gas from metallurgical coke manufacture in this country naturally have action energized in trying to market the gas, and so enhance revenue. To the gas maker who is located where it is reasonable for him to give close, individual consideration to the subject, there are four or five important aspects of the matter that he has to keep prominently in mind. There is the net cost at which the gas can be put into the holder (upon which, of course, depends the charge to the consumer); there are the relative prospects as to future reductions of cost under the present and the coke-oven systems; the constancy of supply; the question of capital expenditure for stand-by plant, or other means of providing security in the event of interruption of supply; and the point as to whether local customers for residuals will be at all injured by the partial or entire cessation of manufacture at the gas-works. The matter is an interesting one, and one for discussion from all points of view; and therefore, we are sure, the communicated article that appeared in the "Journal" last week (p. 24) has received extended attention. The communication is welcomed; for the greater the extent of the published result of the examination of the question in different quarters, and by different minds, the more complete will be the opportunity for gas managers who are immediately interested arriving at a fair judgment in their circumstances upon the subject.

The writer of the article referred to chiefly devotes his attention to the coke aspect. On that point it may be submitted that it does not follow that, if the local production of gas-works coke ceases in a town through the purchase of gas in bulk from coke-ovens, the inhabitants will be bound to take the metallurgical coke provided by the same source. Such a hard, dense coke would not be particularly suitable for replacing gas-works coke for many of the purposes to which it is at present applied; and, as for the inhabitants being committed to a heavier price for a less suitable solid fuel, we hardly think that the open competition in the gas-coke market would allow that to be the case—at any rate, in this country. The normal condition for gas-works coke sales in this country is not such a period as was experienced last half year, during which there was ready disposal of the product, large stocks were cleared off, and many gas-works were only able to keep their coke contracts fulfilled by working as it were from hand to mouth. We can quite imagine that, as a rule, gas undertakings within easy reach of places supplied by coke-oven gas would be only too pleased to dump into those open markets for gas-works coke an ample supply in order to meet the wants of the inhabitants. There is another view. Our esteemed contributor speaks of the local coke consumer having to pay a higher price for his coke on the local gas-works discontinuing production. But we take it that the sole reason for the bulk purchase of coke-oven gas would be that it would be delivered into the gas-works holders at a price lower than the net cost at which the works receiving it can manufacture on its own account. Unless there is gain in this way (which gain would, or should, be largely enjoyed by the consumer) there would be no sense in buying gas from coke-oven owners. There is the point, too, as to the coke-oven industry battening on the gas industry, and gradually usurping a share of the business of the latter. The demand for metallurgical coke, the question of the paying distance to which the gas can be conveyed, and the price at which gas can be delivered into the gas-works holders, are conditions that will limit any overlapping of the two industries. There is one thing that coke-oven people cannot do in this country, and that is supply gas direct to the district of any established gas undertaking.

Looking northward, it is observed that the electricity supply industry and the owners of blast-furnaces are linking up their interests more and more year by year. The waste gases from the blast-furnaces are now being largely employed for the generation of electricity. One of the Companies—the Waste Heat and Electrical Generating Stations—has paid a dividend of 8 per cent. for the past year. But the Durham Collieries Electric Power Company and the Houghton-le-Spring Electric Light Company have not done so well. And here we come across an indication of one of the serious dangers of an alliance of this kind between two industries having totally different objects and obligations. Both of the last-mentioned Companies were affected by the labour troubles in the northern coal-fields last year. In the statement made at the meeting of the shareholders of the Durham Company, we find this: "The "miners' strike upset matters to some extent last year. It "lasted a long time, and several collieries were shut down." This sort of thing would constitute an ever-present fear with responsible gas managers in a position to take gas from coke-oven plants. As we have remarked before, a large capital expenditure on stand-by plant would be necessitated, unless an intercommunication arrangement could be entered into. The Durham Collieries Electric Power Company and the Newcastle-on-Tyne Electric Supply Company have entered into such a scheme to serve as a protection against breakdown. It is also learned that the Newcastle Company in 1909 utilized waste heat from blast-furnaces for electricity generation to the equivalent of 30,000 tons of coal, and last year to the equivalent of 33,881 tons of coal. Such savings represent economy. To further show what is going forward in the electrical industry, the West Hartlepool Corporation have applied for a loan for carrying out a new electricity generating scheme, the feature of which is the employment of the waste heat produced at the blast-furnaces of the Seaton Carew Iron Company, Limited. We point to these matters to show the trend of things in utilizing that which would otherwise be waste. Waste is not economy; but one has to be satisfied that there is real economy and safety before taking part in any such innovation as coke-oven gas utilization for public supply purposes.

Modern Practices in the Smaller Undertakings.

Glasgow is going to have a busy time this year in connection with the gas industry. Last Wednesday, the informal meeting of Scottish Gas Managers was held there; in June the professional members of the industry will meet there in large numbers from all parts of the country; and later on the North British Association will be holding there their annual sitting. This makes a sandwich of gas fixtures in the city of which the Institution meeting will very properly represent the meaty part. The first contribution on Wednesday was not at all bad. If there were no abstruse or highly scientific questions under discussion at the informal meeting, there were several of practical importance, for the introduction of which Mr. J. B. Scott, of Cowdenbeath, was responsible as Chairman. If one wants to find out just how far along the road of general technical and commercial progress the gas industry, not in part but as a whole, has advanced, one cannot do better than examine the position of the smaller works in this respect. It is always expected (the expectation is occasionally ill-founded) that the larger gas-works are right in the van of practice in all directions. But the smallest of works cannot be blamed if they are somewhat in the rear. They cannot be farther advanced than their opportunities will allow. Of late, however, there has been very substantial evidence of how close up with the times many of these smaller works are in their methods.

It might be that if one were looking around for information as to the right course to pursue, one would not instinctively turn for what was desired to the mining burgh of Cowdenbeath, with a gas undertaking whose business Mr. Scott has worked up from small circumstances to some 35 million cubic feet a year. But what do we find there? A strong belief in gas, of an illuminating power of 15 to 16

candles rather than those unnecessary higher powers from which Scotland in parts finds so much difficulty in severing itself; belief in an ordinary distributing pressure of 3 inches; in the pressure being kept as nearly uniform as circumstances will allow; and in the adoption of a high-pressure system for fortifying pressures and maintaining a level gauge in the various parts of the district on the ordinary mains. This is all practice abreast of the times. It is seen, too, that the possession of the high-pressure system for keeping pressures up to the mark, has placed in Mr. Scott's hands a weapon for meeting electrical competition with arc lamps. And he is already offering 1500-candle power high-pressure lamps to be fed from this system, which, under his conditions, puts him on the level with the best efficiency in lighting that the largest of gas undertakings can offer. The street lighting of Cowdenbeath by gas is of a limited order, in view of municipal ownership of the electricity concern; but such outdoor lighting as there is is controlled by pressure-wave apparatus. The economy of this method more than repays installation; and there has been five years' experience and confirmation. The elasticity of the system allows the lighting up at dusk and the extinguishing at 11 p.m.; and the miners are given light again between 5 and 6 a.m. as they are proceeding to their work. The economy of labour, the saving of gas during the night while Cowdenbeath is sleeping, are important. The reliability of the system is attested by the figures given in the address of the Chairman. Respecting the private consumer, from 1½d. to 2d. per 1000 cubic feet is spent on free maintenance. All these points from policy and working, Mr. Scott put forward as pivots upon which discussion might turn. But we want to acknowledge here the completeness of the modern gas policy and practice in this small Scottish mining centre. Many larger undertakings cannot boast of being so completely up to date.

Turning to works' practices, Mr. Scott has improved his carbonizing results by the introduction of Meunier's patent hydraulic main floats, which are of proved benefit in assisting in the maintenance of uniform retort conditions. But bearing on the point of carbonizing results, there is a little doubt in the Chairman's mind as to the benefit of high makes of gas per ton and the saving in coal, having regard to the loss on the residuals side. It may be that in Scotland large makes per ton of coal are not the rule where gas is being supplied at the cheapest rate. But judgment cannot be passed on the point without information in detail. In the South of England, far removed from the source of coal supply, it is found that the higher makes have produced a better showing at the foot of balance-sheets, and that in these cases the prices for gas have been falling fast. However, a very good rule to apply is to take the coal best available for the undertaking concerned, and select the course of manufacturing procedure that will produce, under the circumstances of the works, the highest net revenue return per ton of coal carbonized.

But perhaps the most interesting question of a technical character that was raised in the address was the subject of purifier area in relation to make; and a great diversity of practice is found by Mr. Scott as the result of his personal inquiries. The diversity that he finds is reflected in the quotations in the text-books of the rules laid down by prominent engineers. There does seem to be a tendency nowadays to provide an area greatly in excess of requirements, even taking into account prospective increases of production; the supposition being that greater efficiency and economy are to be obtained from the excess than otherwise. In the interests of economy and working and material efficiency, even distribution of the gas through the material, rate of flow, and time-contact, are essential considerations; and these conditions can only be obtained by causing the purifying area to have a suitable relation to the make and the character of the coal from which the gas is produced. Too much purifying area in relation to the make from the points of view of economy and efficiency is not good; but we will not go so far as to say that it is as bad as having too little area. Glasgow reminds us of Mr. Charles Carpenter's paper at the Engineering Congress in that city now close upon ten years ago, in which this very question was discussed. Then Mr. Carpenter advocated the use of vertical diaphragms in the purifiers so as to be at liberty to reduce or enlarge the area in proportion to the make, in order to get the best possible and uniform work out of the material. Purifier area (a chief topic in the discussion) is one that in practice follows very much individual inclination rather than definite considerations.

Tennis under High-Pressure Gas-Lights.

What with parade lighting, the illumination of the greater part of the Festival of Empire Exhibition at the Crystal Palace, and now the most extensive covered tennis courts in the country, South London is doing well with high-pressure gas lighting; and this under the keenest competition with electricity. An article elsewhere in this issue describes the special requirements in relation to the artificial lighting of covered tennis courts, and how the conditions have been met by the South Metropolitan Gas Company, to the entire satisfaction of expert tennis players, by high-pressure inverted gas-lamps, fitted with reflectors and screens. We are sure the article, telling how the Covered Courts Club are now able to indulge in their favourite recreation after dusk just as though daylight were continuing, will be found very interesting to our readers.

Coalite Affairs—History Repeating Itself.

The little that remains to the two Coalite concerns—the parent and the offspring—was alluded to in last week's issue. The British Company have shut-down all their plant excepting (partially) that at Barking, where they have reduced their staff; and Coalite Limited have withdrawn from the old palatial offices, discharged their staff, and found lodgings elsewhere, sharing the habitation of several other Companies. This has been done for economy; and it is a very wise step too, until —— let that pass. The shareholders of Coalite Limited have met, and have heard what the Chairman (Mr. A. M. H. Walrond) had to tell them. After hearing the little, it surely must be that they there and then gave up all hope. The Chairman did his best under an ugly set of circumstances. He said he still looks hopefully to the future. A chairman who can retain any measure of hope under such gloomy conditions must be very valuable in that office. There was warning, however, from him that all the difficulties have not been passed; but he would not prophesy anything as to the future. Fancy being in the year 1911, and still talking of difficulties to be encountered! It is strange reading when the speeches made year after year at the meeting of the British Coalite Company are remembered. The Chairman of the parent Company talks of the Directors doing their best to pull the affair through. That is what the Directors of both Companies have been trying to do ever since they took office; and where are the concerns now? But technically the most interesting part of the speech of Mr. Walrond was that in which he referred to the trials that were being made with the new "clay retort battery" at Barking. Some time ago we pointed out how largely the plant employed in this carbonizing process of the Coalite Companies (in connection with which the "patents" are still talked about) was the same as that used, or had been used, in the gas industry. Now it is seen that they are departing from iron retorts to clay ones. History repeats itself. The gas industry started with iron retorts, and then turned to clay ones. The gas industry also started with low temperature carbonization, and then went over to high temperatures. Where to-day are the voices and the pens that lauded the coalite process in unmeasured terms and note? They are sadly required now by Coalite shareholders to assist in keeping up their spirits. Perhaps when Sir William Preece returns and faces the British Coalite shareholders, he will make a nice breezy little speech which will please them all.

Misfeasance and Breach of Trust.

There is a bad time in store for the company promoter Eaton and one of his directorial satellites Dr. W. R. White; for Mr. Justice Warrington has been referring to certain of their doings as "gross acts of misconduct and misfeasance," and has declared them guilty of "a breach of trust." There is also to be searching inquiry into the matter of profits made by these men in respect of certain transactions; and they have been ordered to account for those profits to the Ticehurst and District Water and Gas Company. It was this Company that appeared as the plaintiffs in the case. With the names of Eaton and White were at the start associated certain others, as well as that successful piece of promoting mechanism, the Gas and Water Works Supplies and Construction Company, Limited. The East Sussex Gas and Water Company and debenture holders were also mixed up in the affair. Certain shareholders of the Ticehurst Company have felt very keenly the deception that was practised upon them by the promoters of the undertaking; and we saw from the very first that

they intended, if there was a way, to bring Eaton and his colleagues to book. They have succeeded to the extent referred to; but there was no answer on the part of Eaton and White when the case was called on. They kept a distance away. They are of the imperturbable sort. But, if we mistake not, the Court will, now that the matter has started, cause a little disturbance in their rest and cool demeanour. As Mr. H. Terrell, K.C., remarked, the case before the Court was of a complicated character. We think the description would apply to most of the proceedings associated with the promotions of the Eaton group; for their machinery was as perfect as it well could be for making the last possible penny out of the promotions, and for covering their tracks from those outsiders who made it their business to begin to look for them. During the case, Counsel stated that certain books and documents that would now be useful were not forthcoming. We do not envy the person or persons his or their task who have to unearth the facts regarding the profits of Eaton and White in connection with the Ticehurst promotion. And not only profits; there is something to pay in the way of damages.

Misinformed.

Curious notions, like a bad name, live long. The "Engineering Correspondent" of the "Daily Telegraph," writing about the supply of town gas and the production of petrol air gas, makes some disparaging remarks about gas-works. He says that everyone knows that a gas-works is "about the most unsightly feature of the townscape." What about the smoky chimneys of electrical generating stations? The engineers of the electrical industry are not very proud of them. The "Engineering Correspondent" proceeds: "The enormous gasholder rears itself far above the surrounding buildings; and the clouds of steam and malodorous gases which are emitted pollute the atmosphere for thousands of yards around." That is extremely unkind; and it is not true. If it were, those responsible for the conduct of gas-works would spend most of their lives in the local Police Courts. Then we go on to read: "A gas-works is so costly, both in instalment and establishment charges, that it can only be installed where there is a large demand for the illuminant. Consequently rural districts have had to depend on the primitive candle and oil-lamp." Our friend has manifestly little knowledge of the hundreds of small non-statutory gas undertakings that exist in this country to-day.

The Lighting of Torquay.

For a place of its importance and notoriety, Torquay cannot be said to have done well over its public lighting. It was reported at a meeting of the Town Council recently that there were in use in the streets 1089 gas-lamps, of which 869 are supplied with gas by the Torquay Gas Company, while 220 derive their supply of gas from the works of the Corporation in the St. Mary Church district. Nearly one-half of the lamps—434 is the precise number—have flat-flame burners. The process of conversion to a more efficient system of lighting would seem to have been uncommonly slow at Torquay, considering the reputation which the place has to maintain as a health and holiday resort. The explanation is probably to be found in the fact that the Town Council have been more anxious to bolster up the municipal electricity works than to light the streets efficiently. Apparently many of the flat-flame burners have been suffered to remain in the suburban roadways to await the coming of the electric cables, and are now being replaced by electric lamps in the districts which the Electricity Committee are seeking to exploit. There was some complaint at the Council meeting at the slowness with which this process of conversion is carried on; and the promise was made that it should be expedited. It is to be hoped that at the same time the conversion to the incandescent system of the gas-lamps which are to remain will be completed. The Gas Company have been showing the local authorities and the ratepayers recently what can be done in the way of lighting by the adoption of the most modern methods of illumination by gas. It has been an excellent object-lesson, and should stimulate the Corporation at least to make the best use of the gas they consume.

Local and Imperial Taxation.

The question of the relation of Imperial grants to the national services which local authorities are now called upon to discharge, is one that has of late come much to the front; attention having been mainly drawn to the matter through the heavy increases in local rates. The agitation that has been set on foot is not any way to prove entirely barren of result, inasmuch as it was a few days ago announced in the House of Commons that a Committee on Local Taxation has been constituted. The terms of the reference, it is stated, are: "To inquire into the changes which have taken place in the relations between Imperial and local taxation since the report of the Royal Commission on Local Taxation in 1901; to examine the several proposals made in the reports of that Commission; and to make recommendations on the subject for the consideration of His Majesty's Government, with a view to the introduction of legislation at an early date." A glance at the names and qualifications of the gentlemen who are to form the Committee justifies a feeling of hopefulness that some good may come of their labour. At any rate, their report will be anxiously awaited in those quarters where at the present time the burden of local taxation is most grievously heavy. The Chairman of the Committee is Sir John Kempe, K.C.B. (Comptroller and Auditor General); and with him will sit the following members: Mr. F. E. N. Rogers, Vice-Chairman of the Wiltshire County Council; Mr. T. J. Hughes, Vice-Chairman of the Glamorgan County Council; Mr. Lewis Beard, Town Clerk of Blackburn, Mr. A. W. Myles, Town Clerk of Glasgow; Mr. William Murison, Clerk to the Aberdeen County Council; the Right Hon. Sir Henry Robinson, K.C.B., Vice-President of the Local Government Board, Ireland; Mr. H. C. Monro, C.B., Secretary to the Local Government Board; Mr. G. L. Barstow, of the Treasury; and Mr. G. E. P. Murray, of the Education Department. It was further stated in the House that an endeavour was being made to secure the services of someone who is familiar with the conditions existing in London.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 129.)

TAKING things all round in the aggregate, the Stock Exchange has had another good week—not wholly unchequered; for after some days of rising prices, there ensued the almost inevitable reaction on sales to realize profits. But this was very quickly overcome; and the resumed upward march of quotations testified to the real strength of the public support to the markets. In spite of harder money, Consols at the close had improved upon their opening prices; but the greatest rise was again scored in Rails, the activity and buoyancy of which was the leading feature. Prospects were promising from the start. Monday opened bright and cheerful. Consols, after a little pause, rose $\frac{1}{8}$ and $\frac{1}{4}$. Rails were quickly hard at work with some nice rises. Foreign and American had strong points. But, in the Miscellaneous, Rubber and Beer were weaker. On Tuesday, Home Government and other gilt issues were strong, and Consols rose $\frac{1}{4}$ for all dates. Rails were very strong for awhile, but tamed down later in the day. All markets were quiet on Wednesday, under reaction and inaction, and prices receded. Consols lost $\frac{1}{8}$ and $\frac{1}{4}$, Rails were lowered, and Americans were generally weaker. Thursday opened dull, as Wednesday had closed. Prices continued to give way till buyers came in and steadied them; so that the close was much better. The cheering influence governed Friday; and a nice recovery went on during the day. Consols advanced, and Rails were strong and active, with rising prices. This continued through Saturday, which was unusually active, and prices, especially in the Railway Market, made further gains. In the Money Market, there was a good demand for short loans at firm rates, and discount quotations were harder. Business in the Gas Market was much about the same as the week before in its general features. The tone was so steady as to leave quotations almost wholly unchanged; the sole variations being in two Provincial undertakings. In Gaslight and Coke issues, the ordinary showed about its ordinary amount of activity, and the prices at which transactions were marked never wandered outside the limits of $105\frac{1}{2}$ and $106\frac{1}{4}$. The secured issues were moderately dealt in; the maximum changing hands at 86 and $86\frac{1}{2}$, the preference at from $101\frac{1}{8}$ to 102, and the debenture at from $80\frac{1}{4}$ to 81. South Metropolitan was more active at the old figures of $119\frac{1}{4}$ to $120\frac{1}{4}$; and the debenture marked $80\frac{1}{2}$. In Commercials, the 4 per cent. was done at $114\frac{1}{2}$ and 115, and the $3\frac{1}{2}$ per cent. at 110. Among the Suburban and Provincial group, Alliance and Dublin was done at $85\frac{1}{4}$, ditto debenture at $96\frac{1}{4}$ (a fall of 1), Brentford old at $253\frac{1}{4}$, ditto new at $198\frac{1}{4}$ and 200, British at $44\frac{7}{8}$, Hastings and St. Leonards at $93\frac{1}{2}$, South Suburban at 120, Tottenham "B" at 116, and (on the Liverpool Exchange) Chester at $110\frac{1}{2}$. In the Continental companies, Imperial Continental realized from $191\frac{1}{2}$ to $192\frac{1}{2}$, Continental Union $96\frac{1}{2}$, European from $19\frac{1}{2}$ to $19\frac{15}{16}$, and Tuscan 9 free. Among the undertakings of the remoter world, Bombay made $6\frac{5}{8}$ and $6\frac{7}{8}$, ditto new $5\frac{1}{2}$ and $5\frac{5}{8}$, Buenos Ayres $97\frac{3}{4}$, Primitiva from $7\frac{3}{4}$ to $7\frac{15}{16}$, and ditto preference from $5\frac{1}{4}$ to $5\frac{3}{8}$.

THE PUBLICITY CONFERENCE.

THE conference which was held yesterday on the question of the publicity scheme for the gas industry was a great success. The large hall of the Institution of Mechanical Engineers was practically filled; and it may be said that the utmost enthusiasm prevailed. Gas undertakings in towns from Scotland and Ireland to the South of England, and from Wales to the extreme Eastern district, were represented; and the representatives were probably as numerous from municipal gas committees as from gas companies. The President of the Institution (Mr. Alex. Wilson, of Glasgow) was in the chair; and on the platform he was supported by the Vice-Presidents (Mr. R. G. Shadbolt and Mr. J. Ferguson Bell), the Hon. Secretary (Mr. S. Y. Shoubridge), and the Controller of the Sales Department of the Gaslight and Coke Company (Mr. F. W. Goodenough). Others on the platform were Messrs. E. Allen, F. T. Eustace, D. H. Helps, W. R. Herring, Herbert Lees, S. Meunier, J. W. Morrison, W. E. Price, J. H. Troughton, John Young, and Mr. Walter T. Dunn. The Committees of the Society of British Gas Industries were also represented by their Chairmen.

The President and Mr. Goodenough laid before the meeting in general terms the plan of the scheme. One thing was strongly impressed, and that was that the campaign is not so much an aggressive one as an educational one in favour of gas. The work to be done is in making people acquainted, and keeping them acquainted, with the modern developments of gas appliances; and also in trying to develop the uses of gas where this is at present employed. There is likewise the protection of existing business, and the educational work that results in opening up extensions of it. The work of the Committee will also include the correction of error and misrepresentation. They propose to so order their work as not necessarily to supplant present individual effort, but to reach, in a more efficient manner than is now done—by articles and advertisements in the evening and weekly papers which are bought by the working man, in the magazines which are found in the homes of the middle classes, and in the papers read by the ladies—all sections of the community. The Committee propose to make this an active co-operative agency, through which, by the employment of the best talent and work gas undertakings will be able to obtain well-written and illustrated pamphlets and circulars, artistic posters, &c., at a price at which they could not be procured by an individual undertaking acting on its own account. In this way, through this co-operation the burden can be lightened. There is also the question of efficient lecturers. In fact, the further the President and Mr. Goodenough went, the greater appeared to be the possibilities of the agency of the Committee.

The case for the scheme having been put, it was further accentuated by Mr. Robert Watson, in whose capable hands was the resolution upon which discussion ensued. Before the discussion ended, it was modified so that it read, in effect, as follows: That the scheme proposed by the Publicity and Special Purposes Committee of the Institution of Gas Engineers, and set forth in the statement issued on Jan. 2 last and further explained in the memorandum [read by Mr. Goodenough] to-day, is approved, with reservation as to the amount of the subscription; and that the Committee be requested to take all necessary steps to bring this resolution to the notice of gas undertakings, especially drawing attention to the fact that the subscribing undertakings will be represented on the Committee administering the funds. In the discussion that ensued, members of municipal gas committees and directors of gas companies, as well as engineers and secretaries, were equally eager over the scheme; but there was a feeling among some of the municipal representatives that if the subscription per million cubic feet of gas sold were reduced somewhat—2s., 1s. 6d., and 1s. were suggested—there would be a better chance of getting through the Councils the question of subscribing. But when it is pointed out that the subscription of 2s. 6d. per million only represents 0·03d. per 1000 cubic feet of the gas sold in the United Kingdom, it seems rather a trifling matter to cavil at the difference that 2s. 6d. represents in comparison with the smaller sums named. That is why the resolution was amended so as to give the Committee an opportunity to further consider the question of subscriptions.

Bearing on this point there was another. It was that the Committee should begin in a small way, and when the results were seen they would be an inducement to larger subscriptions. But it was pointed out that it was rather hard to suggest that the Committee should show big results on small means; and the matter was not pressed. On the contrary, the real feeling of the meeting was: Push forward.

It was an altogether enthusiastic gathering—more enthusiastic than many we have seen in the gas industry; and it was generally agreed that here we have a matter that can be regarded from a very broad point of view, that here we have a scheme in which co-operation can carry the work of the gas industry farther along the road of prosperity. So the resolution was adopted without a single dissentient vote, though a few, but a very few, refrained from voting—in the main, it may be taken, until there has been an opportunity for reporting to Boards of Directors and Committees at home.

ELECTRICITY SUPPLY MEMORANDA.

Street Lighting Statistics—Cost per Candle Power—Cost per Mile—Low Lighting Rates in Gas-Lighted Boroughs—Ancient Gas Lighting and Modern Electric Lighting Compared—Electrical Fires in the City—More Cookery Absurdities.

OUR electrical contemporaries have received, but we have not, from Mr. H. Tomlinson-Lee, the Engineer of the Wimbledon Electricity Department, a table of statistics that he has collected relating to street lighting by electricity and gas. The table having been published, there has been some little interest in looking into the figures as presented, though there are no means of checking their accuracy. We really do not understand why Mr. Tomlinson-Lee has published the table, as it is a splendid argument for retaining gas lighting, and for having nothing whatever to do with electric lighting, in the interests of the ratepayers. We are reproducing the table on another page for the information of readers. Our electrical friends find in it one thing upon which to pat themselves on the back. In the case of electricity, generally speaking, the costs per candle power per annum are shown (whether they are actually so we cannot say) to be less than in the case of gas. On this point there are one or two things to say, and some information to be obtained. Are the number of hours of lighting equal for electricity and gas? Are all the candle-power figures based on actual photometrical tests, or are they merely the makers' nominal candle powers for the electric lamps, and guesswork for the gas-lamps? We have met with similar costs per candle power per annum before; and when lamps have had the photometer directed against them, the tale has had a different complexion put upon it. Then there is another point. Is Mr. Tomlinson-Lee a Britisher, and does he love fairplay? The double-barrelled name looks British enough; but as to the fairplay, we must have his solemn assurance that he is a lover of it before credence can be given to it on the testimony of the table before us. How has Mr. Tomlinson-Lee arrived at the lower cost per candle power for electricity? By throwing in the weight of the electric arc lamps against ordinary low-pressure incandescent gas-lamps, and in all probability in some districts a good sprinkling of flat-flame burners. Is that fair play? The proper comparison as to cost per candle power per annum is between photometrically tested electric arc lamps and high-pressure gas-lamps of the latest inverted type; as also between metallic filament lamps and low-pressure inverted gas-lamps. For instance, a fair comparison would be the average cost per candle power per annum of the high-pressure inverted gas-lamps and the electric arcs in Westminster on photometrical testings, and that of the specimen metallic filaments and the low-pressure inverted gas-lamps there. Of course, photometrical tests and average cost per candle power are not everything in this matter of street lighting. The Gower Street (Borough of Holborn) tests recently showed that, though the inverted gas-lamps used were nearly 100 candles lower in illuminating power than the metallic filament lamps, the minimum candle power, or the minimum illumination along the centre of the roadway, was superior in the case of the gas-lamps. We notice that the present collector of statistics has not separated out the number of miles lighted electrically and the number of miles lighted by gas. But when the total number of electric lamps is taken on the one hand, and the total number of gas-lamps on the other, it is seen that the number of gas-lamps, as a rule, preponderate; when we take the columns as to total cost, including renewals, repairs, and attendance, it is seen that the preponderance of cost (notwithstanding the greater number of the gas-lamps) is, as a rule, under the heading of electricity. Marylebone has not supplied any costs as to its electric lighting, so we may deduct the electric lamps from the totals. Having done this, we find the table contains 5355 arc lamps and 9524 electric incandescents—together 14,879; while the gas-lamps total to 60,955. But these 14,879 electric lamps cost more than the 60,955 gas-lamps—the respective costs being £7001, against £6681! Perhaps Mr. Tomlinson-Lee will see from this the absurdity of comparing costs per candle power under these circumstances. If he cannot, then we are sorry for him.

There are two points that our electrical friends do not emphasize in connection with the figures in the table. One is that, where gas only is retained, the cost per mile per annum is considerably lower than where electricity only is employed, or where there is a mixed scheme of gas and electricity; and the other is that, where gas only is used, there the lighting rate per pound per annum is the lowest. That is a matter for consideration by the ratepayers. While thanking Mr. Tomlinson-Lee for the figures, we assure him that his comments on these points would be of peculiar interest. The only two examples of street lighting solely by electricity for which cost figures are given, are Wimbledon and Leyton. Marylebone (as already stated) is an example without cost figures, as, we are afraid, the returns there would not compare well with those boroughs in London that are lighted by inverted gas-lamps under the new contracts. Take Wimbledon first. The number of miles lighted is about 46; and the total number of electric lamps is 1227, which is equal to 26 lamps per mile. The average cost per mile there is £144·96; and the approximate lighting rate per pound per annum is 3·78d. Of the cases where gas is used solely, the nearest approach to Wimbledon conditions is Lewisham, where there is an average of 25 gas-lamps per mile (3305 lamps, divided by 132 miles). The average cost there is £60 per mile lighted; and the approximate lighting rate is 1·74d. What has Mr. Tomlinson-Lee to say to the

comparison? Leyton also averages, with 1656 electric lamps and 66½ miles, approximately 25 lamps per mile. The cost there works out to £129·95 per mile; while the lighting rate is 4·05d. The lighting rate, in fact, is low wherever there has been adhesion to gas, and so is the cost per mile—lower, as a rule, than where electricity has been introduced, notwithstanding the low price per unit at which municipal purveyors of electricity supply the street lamps in their areas.

Of course, the number of gas-lamps per mile and their individual lighting power are factors in the cost per mile. At Camberwell, with an average of about 35 gas-lamps per mile, the cost is only £91·04 per mile; the lighting rate being approximately 2·11d. At Deptford, where there is an average of 38 lamps per mile, the cost is £95·32; the lighting rate being down at 1·81d. There is Finsbury, with an average of 53 gas-lamps per mile. The cost there per mile is £187·84; while the lighting rate is only 1·60d. There is Lambeth content with an average of about 34 lamps per mile. The cost is only £84·96 per mile; the lighting rate 1·6d. Paddington prefers an average of nearly 67 lamps per mile. The cost there is £194·16 per mile; and the lighting rate is 1·95d. Holborn has an average of 74 lamps per mile. The cost per mile is £275·80; but the lighting rate is only 1·59d. Some of these figures will be lower still when the conversion schemes to inverted gas-lamps are completed. The figures as to the lighting rate where there is a good proportion of electric lighting are significant, and so are some of the total costs per mile. The table, however, being reproduced in another part of the "JOURNAL" (p. 123) will enable those interested to make comparisons of their own. We hope Mr. Tomlinson-Lee will, by replying to our inquiries and comments, give us an opportunity of a little discussion with him over the lessons of the table. If he complies, there are four other columns we should like to have included in the table, headed: "Hours of Lighting of Arc Lamps;" "Ditto of Electric Incandescents;" "Ditto of Gas-Lamps;" and the fourth separating the gas-lamps fitted with flat-flame burners (we are sorry that in some places they are still partially in use) from the incandescents.

There is a race among the nations for the honour of discovery of the South Pole; and some of our home electrical journalists not to be outdone appear to have entered into a competition to see who among them can put forward the greatest absurdity in comparisons between gas and electric lighting. "Meteor" of the "Electrical Times" so far appears to have won. A couple of days before April 1, his first note was headed "Electricity One-Fifth the Cost of Gas." But "Meteor" in what succeeds fails to tell us how the gas was used; but he does inform us that the electricity was employed with metallic filament lamps. It is quite conceivable that, if gas is consumed in such a manner that 5 cubic feet are required to do what ½ cubic foot will do to-day, and less than ½ cubic foot with the highest efficiency low-pressure gas-burners, the supplanting of the antiquated wasteful method of using gas by low-voltage metallic filament lamps (with electricity at the price at which large public institutions can obtain it) will show a saving that will be represented by four-fifths of the former cost. But if the most modern form of using gas for interior lighting is adopted, what are the relative positions then? Our friend's remarkable find is in the *agenda* of the Metropolitan Asylums Board for March 25. It compares the cost of gas and electricity during the years 1908 and 1910. The particulars given during these two years are really intended to show the difference in the cost between electric carbon filament lamps and metallic filament lamps; while in the case of one establishment—the North-Eastern Hospital—the figures show the difference between the cost of gas as then consumed and electricity as now used. No information is supplied as to the conditions of the use of gas in 1908. But first as to the total savings by modernizing the lighting arrangements. In March, 1909, the Engineer-in-Chief anticipated a saving of something like 50 per cent. by the introduction of metallic filament lamps in place of carbon filaments in various establishments under the Board. He now says that the total cost of installing metallic filament lamps has been £2923, while the total net economy due to such installation has been £3044—this result having been obtained after due allowance has been made for the increased cost of maintenance.

Turning to the table given as an appendix to the report, it is seen that in the case of the North-Eastern Hospital £1281 was spent in 1908 on gas, £12 on renewals, and nothing on electricity; while (£510 having been expended in installing metallic filament lamps) in 1910 the amount spent on gas was £254, on electricity £186, and on renewals £63. The net annual saving was therefore £790. It may be for aught we know that some of the saving on gas is due to conversion from flat-flames to incandescents. But it would be interesting to learn what were the conditions in 1908 in respect of gas-lighting, and what is the candle-power of the metallic filament units now employed. With this information, we might be able to get at the truth of the matter. The small amount spent on renewals for such an establishment as the North-Eastern Hospital in 1908 suggests the antiquated mode of use; and some of the other figures in the table appear to confirm this. For instance, the North-Western Hospital only used £243 worth of gas in 1908, and £514 of electricity; while last year £219 was spent (practically the same) on gas and £251 on electricity. Further confirmation of the proof of antiquated gas lighting is furnished by the report that the Engineer-in-Chief made towards the end of 1909 on experiments he had been engaged in with incandescent gas mantles at Darenth Asylum. This was subsequent to the issue of the report containing the recommendations as to the substitution of carbon filament lamps by low-voltage metallic filaments. This is the comment made in the "Memoranda" on the subject at the time:

> Darenth Asylum has been the scene of the experiments; and there wasteful and inefficient gas lighting by flat-flame burners has been the vogue. The average weekly consumption of gas during the darkest weeks of the year has been 364,749 cubic feet. Conversion to incandescent gas lighting will only claim an initial expense of £273 11s. 6d., exclusive of fixing. The annual expense of mantle and glass renewals is estimated, as the result of the Engineer-in-Chief's experiments, at £50; the consumption of gas will be reduced by at least one-half; and three times the light will be obtained. In this respect, he has underestimated, rather than over-estimated, the result; seeing that 5 cubic feet of gas consumed by a flat-flame burner per hour will only give a light of about 10 to 12 candles, while the same quantity of gas will afford in an inverted lamp a light of about 100 candles. In the darkest weeks of the year, the saving will be about £18 per week, and proportionately in the remainder. What have the electrical folk to say to the resolution of the Metropolitan Asylums Board to carry out the conversion?

It is seen here that a substantial saving, for a low initial expenditure, was to be made in costs by a change-over from flat-flames to incandescent gas-burners. The Engineer-in-Chief having been towards the end of 1909 engaged in experiments on incandescent gas-burners, is fairly good evidence that, in the other establishments under the Asylums Board, the flat-flame burner was the vogue. Otherwise the experiments would not have been necessary at Darenth Asylum. We guarantee that with a system of inverted gas-burners at the North-Eastern Hospital, the cost, light for light, for an equal number of hours, would work out at a lower figure than by metallic filaments. But the chief point is, are the electricians so hard pressed that they must take advantage of savings shown by a comparison of an old-fashioned, crude system of gas lighting with the most up-to-date system of electric lighting? Cannot they afford to let the merit of economy stand comparison between the best that gas lighting can offer and the best that electricity can present? It is not usually considered fair to hit below the belt. But there are electricians who, in dealing with gas matters, do not trouble about the dishonour.

In the annual report of Dr. F. J. Waldo, the Coroner for the City and Southwark, it is stated that he inquired into 152 fires last year; and in 125 the cause of the fire was determined. There are 27 fires the causes of which remain "unknown." In 19 fires, compared with 13, in 1909, he was able, with the expert assistance of the City Electrical Engineer, to decide that they were due to defective electrical arrangements.

The Berry Construction Company, Limited, are trying to work up a larger business in electrical cooking appliances; and they are attempting to do this by indulging in statements that it ought to be someone's business in the gas industry to at once check. A column advertisement, in the form of an article, appeared in the "Daily Telegraph" last Saturday, with the name of the Company at the end of the string of absurdities that constituted the advertisement. We should not at all mind how much electrical engineers and traders "spread" themselves in the Daily Press, nor the length of the extravagant language they indulge in, if they refrained from slandering gas by absolute untruths. We ask the Berry Construction Company whether they are prepared to substantiate their statements by definite, scientific tests, as to the poisonous fumes from the combustion of gas and the absorption of those fumes by food cooked by gas? In their advertisement-article, speaking of cooking by gas, allusion is made to "the effect of the absorbed fumes (in the food) upon the digestion;" and within a couple of lines it is stated that "gas gives forth poisonous fumes." Now these are categorical statements, with the name of the Berry Construction Company, Limited, attached, so they take full responsibility for them. Are these statements true or false? If (as we know them to be) they are false, then they do an injury to the business of every gas undertaking in whose district the "Daily Telegraph" has circulation. This poisonous fumes slander is the most objectionable feature of latter-day electrical advertising; and it is the more surprising that it is adopted and made use of by educated men. We will not trouble to go through the extravagances and absurdities of the advertisement in question, nor the curious phraseology, such as in the sentence in which "gas-cooked absorbent food" is referred to. All this can pass. The public mind, tutored by experience, is not so absorbent of falsity as electrical advertisers apparently desire.

Illuminating Engineering Society.—The next meeting of the Society will be held on Monday, the 24th inst., when Mr. Haydn T. Harrison will present a paper on "The Ratio of Light to Illumination," and Mr. P. J. Waldram one on "The Effect of Wall-Papers upon the Illumination of Interiors." Mr. Harrison will give a definition of light values from the point of view of illuminating engineers compared with the usual trade descriptions, and conclude with some observations on general *versus* special illumination, and the effect of great variation in the degree of illumination. Mr. Waldram, in the course of his paper, will emphasize the value of bright walls, physically, commercially, and as illuminants; and he will submit tests of table plane illumination and of wall brightness in rooms of different sizes with lamps fixed at various heights in the presence of wall-papers of different colours.

OBITUARY.

JOHN EUNSON.

It is with much regret that we record the sudden death last Tuesday morning, within a few hours of his 79th year, of Mr. John Eunson, the Chief Engineer of the Northampton Gas Company, and Consulting Engineer to the Northampton Corporation. He had not been well lately, and had visited Dover with the view of benefiting by the change. He returned to Northampton on the 1st inst., and, still being unwell, he was attended by his medical adviser. On Monday, however, he was at his office as usual, and in the evening went to his club, where he chatted with several friends, and was apparently in good spirits. He returned home early; and passed away at about 7.15 next morning. He had been suffering from heart affection, but otherwise was remarkably active and vigorous. He was one of the most highly-esteemed gentlemen in Northampton; and though he took no part in public life, he was widely known and appreciated for his many sterling qualities. His death will be keenly regretted by a large circle of friends.

Mr. Eunson was born at Kirkwall; and his father, Mr. John Eunson, was the first man to introduce gas into Orkney. Later he received an appointment as Manager of the gas-works at Musselburgh; and while the deceased was still a boy, his father was appointed Manager of the Wolverhampton Gas-Works. He was one of the earliest managers to employ clay retorts. He gave his son a sound education. The lad went first to the Wolverhampton Grammar School and then to Queen's College, Cork. Subsequently he was in the Horseley Engineering Company's works at Tipton. Returning to Wolverhampton, he was for some time associated with his father, who had for years been Consulting Engineer to the Northampton Gas Company. The Directors of the Company, who were in need of a Manager, asked Mr. John Eunson if he would take the position. He accepted the offer, and in 1854 entered upon his duties. From that year, until his death, he presided over the destinies of the Company, which, under his wise and expert guidance, became a very flourishing concern. As an example of the growth of the business, it may be mentioned that in 1854, the sale of gas was 22 million cubic feet per annum; at the present time it is 700 millions. Then the works, which were started in 1823, employed about 20 men; now there are 339 in the service of the Company. Up to the last Mr. Eunson was most diligent in his attendance to his duties. In addition to his appointment with the Northampton Gas Company, he was Consulting Engineer to a number of neighbouring gas companies.

In November, 1877, Mr. Eunson was appointed Consulting Engineer to the Northampton Water Company; and his first work was to improve the plant, which had been neglected, and look round for additional supplies of water. In connection with the latter work, he had the assistance of Professor Boyd Dawkins, F.R.S., and Mr. Robert Etheridge, F.R.S., in exploring the geology of the district. Borings were undertaken, but unfortunately without success. Having satisfied himself that there were no underground supplies of water within reasonable distance of Northampton, Mr. Eunson visited every locality in the county in which there was any water; the result being the selection of the Ravensthorpe valley. In association with the late Mr. Thomas Hawksley, the Ravensthorpe reservoir was constructed; the work being completed, and the first water pumped, on May 22, 1890. He also carried out the scheme for an engine and boiler house, and was responsible for increasing the filtration area of Ravensthorpe by one-third, and the permanent utilization of a supply by gravitation from Coton. In 1884, the water-works were acquired by the Corporation; but Mr. Eunson was retained as Consulting Engineer up to the time of his death. He never ceased to take a particularly keen interest in the water supply of the town; and his advice and experience were of great value, and were highly appreciated by the Engineer (Mr. F. Tomlinson). Besides his work at Northampton, Mr. Eunson carried out a great deal of important engineering work in connection with water supply at Towcester, Brackley, Newport Pagnel, and elsewhere.

Mr. Eunson joined the British Association of Gas Managers in 1872, and passed into the Gas Institute. He was also a member of the first Institution, but not of the second. He joined the Association of Water Engineers on its formation in 1896, but did not take an active part in its proceedings. He was admitted an associate member of the Institution of Civil Engineers in 1871. As already mentioned, he did not take part in the public life of Northampton; but he was a Justice of the Peace (receiving this honour in 1908), and was a regular attendant on the Bench. He was a popular Freemason, and was one of the first members of the Delapre Lodge, of which he was an old Past-Master. He was also Past Provincial Grand Standard Bearer for Northants and Hunts. When he attained the Jubilee of his management of the Northampton Gas Company, he was presented with a silver salver and a handsome cheque.

Mr. Eunson leaves a son, Mr. G. S. Eunson (who was associated with him as Joint Engineer of the Northampton Gas Company) and a daughter, Miss Ethel Eunson. The eldest son, Mr. Harry Eunson, a mining engineer, died in India ten years ago.

The funeral, which was of a public nature, took place last Friday, in St. Giles's Churchyard, Northampton; and it was attended by a large number of friends desirous of paying the last tribute of respect to one who was greatly esteemed. The procession was led by some 200 of the Gas Company's workmen; the older servants being nearest the coffin, immediately following which came the family mourners and the Company's Secretary (Mr. C. H. Batten). At the church were the Mayor (Mr. Samuel Yarde) and members of the Corporation, brother Magistrates, the Directors of the Gas Company, Mr. G. W. Tomalin (of the Water Department), and representatives of several public bodies; while members of the Delapre and other Masonic Lodges formed a guard of honour at the entrance. Among those who sent apologies for non-attendance was Mr. Joseph Tysoe, the Engineer-in-Charge of the South Metropolitan Gas Company's East Greenwich station. The service, which was choral, was conducted by the Rev. S. Wathen Wigg, of Walgrave (a very old friend of the deceased), the Rev. J. A. Gurney (Vicar), and the Rev. Canon Lloyd T. Jones. There were many beautiful floral tributes, which were carried to the church by the workmen.

At a meeting of the Borough Magistrates prior to the funeral, a resolution expressing warm appreciation of the services of the late Mr. Eunson, and condolence with the family, was passed. The Mayor and several Magistrates spoke to the resolution, which was carried in silence—those present standing.

The death last Wednesday of Mr. Edward Henry Pember, K.C., removes one who was in his day a leader at the Parliamentary Bar. He was born on May 28, 1833, and was educated at Harrow, whence he matriculated at Christ Church in 1850. He was called to the Bar by Lincoln's Inn in 1854, became a Q.C. in 1874, and a Bencher of his Inn in 1876. His professional career was associated almost entirely with parliamentary work in the Committee-rooms. In his earlier days as a leader he was pitted against Sir Edmund Beckett (afterwards Lord Grimthorpe) and Mr. Venables; and in his later days against Mr. Pope and Sir R. Littler, not to mention other contemporaries. He had for some years retired from practice.

According to a telegram from the Paris Correspondent of the "Daily News" last Tuesday, the death has lately occurred of M. Clamond, whose incandescent burner was introduced, and attracted some attention, about thirty years ago. In conjunction with the Lewis burner, it represented "incandescent" gas lighting at the Crystal Palace Electric and Gas Exhibition in 1882. It will be in the recollection of some of our readers that the burner was an inverted one; the gas and air passing down through a box-like arrangement made of metal. From the lower surface was suspended a conical "basket," the walls of which were composed of twisted threads of magnesium oxide. A cage, consisting of a few thin platinum wires, supported the basket. The size of the burner was 2¼ inches long; the section of the cone at the base being ⅞-inch in diameter. The air supply was maintained at a pressure of about 6 inches of water. Tests of the burner made at the time of the exhibition showed that the duty was 32·7 candles with a consumption of 7·7 cubic feet of gas, or about 4·25 candles per cubic foot. It was considered that the extreme fragility of the basket and the necessity for an artificial air supply must diminish the utility of the burner. The inventor subsequently abandoned the air supply under pressure; and an illustrated description of his improved form of burner will be found in the "Journal" for Sept. 11, 1883, p. 449. But the appliance never came into general use. It is stated that during the later years of his life M. Clamond was at work on the problem of the separation by mechanical processes of the oxygen and nitrogen of the air; but he died before finding a satisfactory solution.

PERSONAL.

Mr. F. Arthur Last—one of the staff of the Ipswich Gas Company—has been appointed Secretary and Manager of the Halstead (Essex) Gas Company, in succession to Mr. F. R. Child.

At last Tuesday's meeting of the Institution of Civil Engineers, Mr. Reginald A. Helps (son of Mr. J. W. Helps, of Croydon) was elected an Associate Member. Mr. R. A. Helps is Assistant to Mr. Morris at the Jersey Gas-Works.

Mr. Jacques Abady is expected to arrive in London in the course of this week, after his visit to Calcutta in connection with the affairs of the Oriental Gas Company. It may be remembered that Mr. Abady left England on Oct. 21 last year.

In the "Journal" for March 7 (p. 668), we announced the retirement of Mr. H. J. Smythe, the Engineer of the Maidstone Gas Company. We learn that Mr. Frank Livesey, Assoc. M.Inst.C.E., who has for about three years been associated with Mr. Smythe, has been chosen to succeed him, and will take up his duties from the end of May, when Mr. Smythe will relinquish the position. Mr. Frank Livesey, it may be remembered, is a son of the late Mr. Frank Livesey; and before going to Maidstone he was with Mr. J. W. Helps, at Croydon. He studied engineering under Professor Ewing at Cambridge, and took his B.A. degree in Mechanical Science.

We learn from Mr. Vincent Hughes, the Engineer of the Smethwick Borough Gas-Works, that his Committee have placed an order with Messrs. Duckham and Cloudsley, Limited, for an installation of Woodall-Duckham vertical retorts, capable of producing 1¼ million cubic feet of gas per 24 hours, with provision for a further larger installation.

SURFACE COMBUSTION, AND ITS INDUSTRIAL APPLICATIONS.

Second Lecture by Professor W. A. Bone, D.Sc. Ph.D., F.R.S.

THE lecture theatre of the Royal Institution of Great Britain last Thursday afternoon presented an unwonted appearance when Dr. W. A. Bone, Livesey Professor of Applied Chemistry at the Leeds University, delivered the second of his lectures on the above subject, the object of which was to demonstrate some of the industrial applications of the new process of incandescent surface combustion. Behind the well-known horseshoe-shaped lecture table were to be seen a steam-boiler, diminutive in size true, but a perfect boiler nevertheless, as well as a diaphragm of an area of 4 square feet, with which demonstration was to be made. On the table itself were diaphragms of the porous refractory material, crucibles, furnaces, and other heating appliances which were all to throw light as the lecture proceeded upon the—we must say, merely the fringe of the—possibilities that lay before this new system of obtaining the highest efficiency in respect of radiant heat that has yet been achieved by means of gaseous combustion. A larger number of gas men was present to witness these remarkable demonstrations than at the previous lecture, which was largely historical and explanatory of the system.

It will be understood that what follows is a report of the lecture, and not a prepared dissertation on the subject by Professor Bone. Moreover, as he explained at the outset, in order that the explanatory part of the lecture should not be unduly interfered with by the noise necessarily associated with some of the demonstrations, he had been obliged to disarrange their logical sequence even at the risk of his remarks appearing somewhat disjointed.

A Highly Incandescent Diaphragm without Flame.

Professor BONE said: In my lecture last week I considered the nature and causes of the phenomenon called surface combustion. It is my intention this afternoon to demonstrate to you how surface combustion can be realized and industrially applied by means of two processes which have been evolved by Mr. C. D. M'Court and myself during the past eighteen months. The first process is exhibited in the plate of porous refractory material which you see behind the table. From a suitable feeding-chamber there is passed through the porous diaphragm a mixture of coal gas and air in their combining proportions; the amount of air being actually in slight excess of that required to complete the combustion of the gas. The mixture is now passing through the diaphragm, and is burning without flame within a layer about $\frac{1}{8}$-inch in thickness at the surface, producing the highly incandescent effect which you see. The diaphragm has a total area of about 4 square feet; and I want you to understand that the combustion of the gas is limited to a very thin layer immediately below the incandescent surface—there being no heat at all generated in any other part of the apparatus. In fact, I can (as you observe) put my hand on the back part of the apparatus. It is actually colder than my hand, and therefore feels quite cold when I touch it. [Here, as also at frequent intervals during the lecture, the audience expressed their appreciation of the convincing experimental proof by applause.] Now I will demonstrate to you how thin is the layer in which the actual combustion is taking place by momentarily altering the supplies of gas and air to the diaphragm. My assistant has slightly reduced the gas supply by gently tapping the gas-cock, and you see how, in an instant, the incandescence of the diaphragm has diminished. He will now restore the proper supply of gas, and you see that the surface at once attains its brightest incandescence. This instant response to a slight variation in the gas supply shows that combustion is confined to the thin layer immediately below the surface. There is no reserve of heat to be drawn upon in the main body of the diaphragm behind the incandescent surface.

Diagram showing Section of Porous Diaphragm with Mixing-Chamber at Back.

A Furnace for Crucibles.

The next process which I will demonstrate consists in injecting an explosive mixture of gas and air in their combining proportions into a bed of highly incandescent refractory material through a suitable orifice or passage at a speed greater than the velocity of back-firing of the mixture. The slide on the screen shows the process applied to the heating of a crucible furnace. The mixture of gas and air is injected through a narrow orifice at the base of the furnace, and, as it impinges upon the incandescent bed, combustion is almost instantaneously completed. The products of combustion rising round the crucible, and being baffled by the particles of granular material surrounding it, rapidly impart their heat to the bed, maintaining it in a high degree of incandescence. We have in the small tilting furnace on the table a crucible containing a charge of cast iron. This charge has only been in the crucible for about ten minutes from the time of starting the furnace; and it is already molten and ready for pouring. Mr. M'Court and his assistant will now pour out the molten metal into a mould by tilting the furnace. This having been done, Professor Bone proceeded: This process of heating can be adapted to a large number of furnaces—for example, it is very adaptable to the heating of muffle and annealing furnaces, also possibly to the heating of retorts, and various other kinds of furnaces in which the chamber has to be heated by a source of heat external to it. Moreover, any kind of combustible gas ordinarily used in industrial processes is amenable to this system, though, of course, the maximum temperature attainable will naturally depend upon the calorific power of the particular gas used.

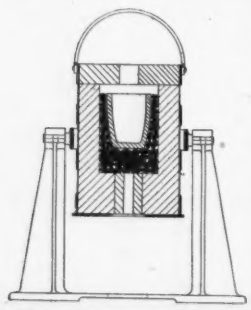


Diagram showing Arrangement for the Heating of a Crucible.

Temperatures Attainable by Process with Coal Gas Limited by Refractoriness of Material Composing Furnace.

Another diagram was now thrown upon the screen. In regard to it, the lecturer said: In this diagram you have an arrangement for applying the process to the heating of an ordinary muffle furnace. In the centre is the muffle, which must be composed of highly refractory material, and round it is a bed of refractory granular material in which the surface combustion takes place. In the floor of the furnace are drilled passages through which the combustible mixture of gas and air is supplied under a pressure of several inches water-gauge, and at a velocity greater than that of back-firing of the mixture. By this method of surface combustion, we can obtain much higher temperatures than it is possible to obtain by the ordinary method of flame combustion without a regenerative system. For example, in this muffle furnace, which was heated up before the lecture began, we are easily able to attain a temperature of anything up to 1500° C. We are really limited in respect of temperature by the refractoriness of the material composing the muffle or the chamber; and our great difficulty during the investigation has been to get a material which will stand such high temperatures as are obtainable by the new process. To give you some idea of these possibilities, I may say that at one stage of the investigation we used a bed composed of particles of carborundum (silicon carbide), which, as you know, is one of the most refractory substances known—thinking that it would withstand the extremely high temperature in our furnace. We soon found, however, that, with active combustion taking place in contact with the surface of the carborundum (and we always have to have a slight excess of oxygen in the combustible mixture in order to get the best effects), the carborundum itself was actually burned to carbon dioxide and silica. [Some samples of half-burned carborundum showing the formation of a white coating of silica were handed round.] You will see on the surfaces of these pieces of partly burnt carborundum, patches of silica, showing that we obtained a temperature approaching 2000° C. As a matter of fact, when we inject a mixture of coal gas and air at the maximum speed consistent with the capacity of the granular bed to burn it properly, we can attain temperatures which no material hitherto used in the construction of muffles is able to withstand very long. The same thing applies also to mixtures of water gas and air. So you see we are limited practically by the temperature which the material composing the furnace will stand, rather than by the temperatures it is possible to obtain by this method of combustion. It will, of course, be understood that the temperatures obtainable with gases of lower calorific intensities than coal gas or water gas are not so high as those just referred to; nevertheless we can claim that, with a gas of given composition, it is possible to heat a furnace to a higher temperature, if the principle of surface combustion be applied, than with an ordinary flame.

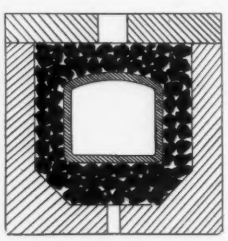


Diagram showing Arrangement for the Heating of a Muffle-Furnace.

Further Points in Connection with Diaphragm Heating.

Reverting to diaphragm heating, there are one or two further points I should now like to emphasize. In the first place, the combustion at the surface is not only extremely rapid, but it is perfect. No unburnt gas ever escapes from the surface layer, when the proportions of gas and air have been finally and properly adjusted. In the second place, with coal gas and air we ordinarily use diaphragms through which the mixture can be transmitted at a pressure of only $\frac{1}{8}$-inch water-gauge in the mixing chamber behind the diaphragm. We can also construct diaphragms to take up to 2 or 3 inches water-gauge. The exact texture of the diaphragm we may select in any particular instance will depend partly upon the purpose for which the apparatus is to be used, and partly also upon the nature and composition of the gas we desire to burn on the surface of the diaphragm. There is no difficulty in the manufacture of diaphragms certainly up to the size of the one behind the lecture table (a square $2 \times 2 = 4$ sq. ft.), which is the largest we have yet attempted. They can be made in various shapes and sizes; and they can be fixed and used in any position or at any angle. We have used them inverted, and indeed in all positions between the horizontal and the vertical

planes. We have also had them burning continuously for weeks together without showing signs of wear or any diminution of their brilliance.

Applications in the Chemical Industry.

I propose to show you next what we hope will become an important application of these diaphragms in the cheminal industry —viz., for the evaporation and concentration of liquids. We are able to evaporate a liquid in a vessel by means of radiant energy emitted from a diaphragm fixed in a horizontal plane above the surface of the liquid. [The casing, carrying the diaphragm with its incandescent surface on the underside, was mounted on a stand, and immediately under the diaphragm was placed a porcelain dish.] We are, said Professor Bone, now evaporating in this dish a solution which it would be impossible to evaporate by the ordinary means of heating the vessel by flame from below. It is a solution of sodium silicate ("water glass"). In evaporating this by radiant heat applied from above, we vaporize the water only in the top layer of the liquid; the lower layers of the liquid being heated very little, if at all. The sodium silicate separates out as a skin on the surface of the liquid; it is then dried by the radiant heat, and at frequent intervals we can skim off the crust of dry sodium silicate. In this way we are not only able to evaporate the solution with a great economy of heat, but we are also able to complete the evaporation of highly concentrated solutions very easily in a way that it is difficult to do by means of heat applied from below. We are also able to successfully concentrate dilute sulphuric acid.

Incandescence Not Dependent on External Atmosphere.

A further point to which I wish to direct your attention with regard to diaphragm heating is the fact that the incandescence of the surface in no way depends upon the external atmosphere. When once the diaphragm is incandescent and the proportions of air and gas supplied in the mixing chamber at the back properly adjusted, the diaphragm will maintain its incandescence unimpaired even in an atmosphere of carbon dioxide. In order to demonstrate to you this point, we have here a chamber with a glass front which has been filled with carbon dioxide; and a lighted taper is at once extinguished when plunged into the chamber. My assistant will now plunge into the chamber a small diaphragm which is in a state of brilliant incandescence. [The diaphragm was plunged into the chamber.] You will observe that, although the surface is now surrounded by an atmosphere of carbon dioxide, its incandescence remains unimpaired, and it will continue so for as long as it may be kept in the chamber.

Beautiful Effect of a Nickel Gauze.

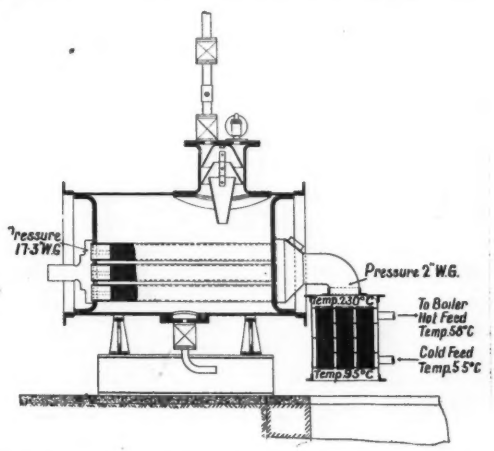
In appliances designed for domestic heating, it is important that artistic effect shall be combined with radiant efficiency. This we may do, in diaphragm heating, by placing a gauze of nickel in front of the diaphragm, a distance of about $\frac{1}{4}$ inch from the incandescent surface. The nickel gauze absorbs a large percentage of the radiations from the diaphragm behind it, and emits it again as radiations of slightly different wave lengths. [On a nickel gauze being placed on the front of a diaphragm, those present agreed with the lecturer that to the eye the appearance was greatly improved.] We are thus able not only to obtain a pleasing effect to the eye, but also to increase somewhat the percentage of the total radiation obtained from the combustion of the gas. Moreover, since the products of combustion from the diaphragm contain a slight percentage of free oxygen (because we use more air than is theoretically required to burn the gas), the nickel gauze will last for weeks together without deterioration, whereas if a nickel gauze be heated in a reducing atmosphere, the wire soon becomes brittle, and the gauze disintegrates. But where an oxidizing atmosphere is maintained, as in diaphragm heating, the gauze is not so affected.

Steam-Raising by Surface Combustion.

I wish now to explain to you somewhat in detail a very important application of surface combustion to steam-raising in multitubular boilers. We have a small experimental boiler fixed behind the table; but as in initially firing it up more noise is made than I can be heard through, I propose to postpone starting it until the close of my lecture, when those of you who are specially interested in steam-raising may like to stay to see the boiler fired, and steam raised up to a pressure of 100 lbs. per square inch. But I will meantime endeavour to explain to you by means of some lantern slides, how surface combustion may be applied to steam-raising, and the high degree of efficiency thereby obtainable.

Now it is well known that hitherto the gas-firing of steam-boilers has not been very successful from the point of view of thermal efficiency. There are two classes of gas which are largely used for steam-raising—one is blast-furnace gas (of which there is always a large surplus available from blast-furnaces plants), and the other is the surplus gas which is obtained in the manufacture of coke in bye-product coke-ovens. Coke-oven gas approximates very nearly to ordinary coal gas in point of view of composition and calorific power. It has been estimated by a prominent blast-furnace engineer that the efficiency of the best type of water-tube boiler, fired by blast-furnace gas, does not exceed something like 55 per cent. From careful observation made on Lancashire boilers fired by blast-furnace gas, and evaporation water previously softened to 4° of hardness, with an attachment of the most approved type of economizers, so that the temperature of the burnt gases going to the chimney was reduced to the lowest possible point consistent with good draft, it has been proved that the average thermal efficiency does not exceed 60 per cent. This figure is probably somewhat higher than the average efficiency usually obtained with boilers fired with blast-furnace gas, and we may consider it as probably a maximum figure in relation to ordinary practice. With regard to boilers fired by coke-oven gas, I think one can safely say that the average thermal efficiency of steam-raising does not exceed 65 per cent., and in exceptional cases it may amount to perhaps 70 per cent.

It must therefore be confessed that the substitution of gas for raw coal in boiler firing has hitherto not been conducive to fuel economy, and indeed boilers are gas-fired only when there are supplies of "surplus" gases which cannot well be utilized in any other way. But on applying the principle of surface combustion to the gas-firing of multi-tubular boilers, we have been able to obtain a thermal efficiency corresponding to the transmission of nearly 95 per cent. of the energy represented by the net calorific value of the gas to the water in the boiler. I will now endeavour to explain the method by which we carry out this firing. The boiler before you is an ordinary tubular boiler (shown on the screen) of cylindrical section. It is traversed horizontally by a series of iron tubes, each 3 feet only in length and 3 inches in internal diameter. These tubes are packed throughout their length with suitable refractory material, broken up and meshed into pieces of suitable size. At the front end of the tube, where the gaseous mixture is introduced, is injected a fire-clay plug through which is bored a circular hole of about $\frac{3}{4}$ inch diameter.



Section showing the Application of the Surface Combustion System to a Steam-Boiler.

This plug serves the double purpose of keeping the front end of the boiler cool, and of providing a suitable aperture through which the gaseous mixture is ignited at a speed very much higher than the speed of back-firing. Attached to the front plate of the boiler is a mixing chamber of special design [not shown in detail on the diagram]. The mixture fed into the boiler tubes from this chamber consists of the combustible gas with a proportion of air very slightly in excess of that required by the complete combustion of the gas. The mixture is injected or drawn in—either by pressure or by suction—through the orifice in this fire-clay plug, on to the incandescent material in the tubes. The combustion of the mixture in contact with the incandescent material is completed before it has traversed a length of about 6 inches from the point of entry to the tube. As a matter of fact, we have failed to discover any signs of unburnt gas at 4 inches from the end of the plug. The result is that the core of the material at this part of the boiler is heated to a high temperature, although the material surrounding this core is so rapidly cooled by the transmission of heat to the water in the boiler that the tubes are never in contact with any material which is really red-hot. In other words, the surfaces of the granules actually in contact with the boiler-tubes are at a temperature much below red heat.

The combustion having been completed, the remainder of the material serves to repeatedly baffle the burnt gases as they traverse the tubes at a high velocity, causing them to repeatedly impinge on the walls of the tubes. The usual rate at which the gaseous mixture is fed into the boiler corresponds to an hourly consumption of about 100 cubic feet of coal gas *plus* six times its volume of air for every tube of the boiler; so that in the case of the ten-tube boiler on which our experiments have been made, the consumption of coal gas has been about 1000 cubic feet per hour *plus* about 5500 or 6000 cubic feet of air. Consequently, you see the mixture is passing through these tubes at an extremely rapid rate. I may remind chemists who may be present that the amount of coal gas injected into each one of these 3-inch diameter tubes is equivalent to the amount of gas which is burned in thirty ordinary bunsen burners. This will perhaps give you a rough idea of the rate at which the gas is burnt in the boiler-tubes.

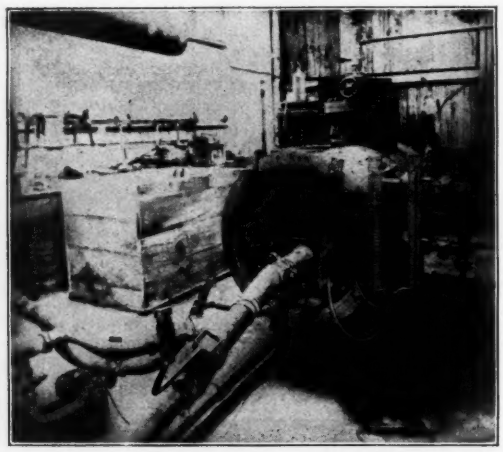
Utilizing the Heat of the Exit Gases.

After the burnt products have traversed the boiler-tubes, and at their point of exit therefrom, it is found that their temperature is never more than about 70° C. above that of the water in the boiler,

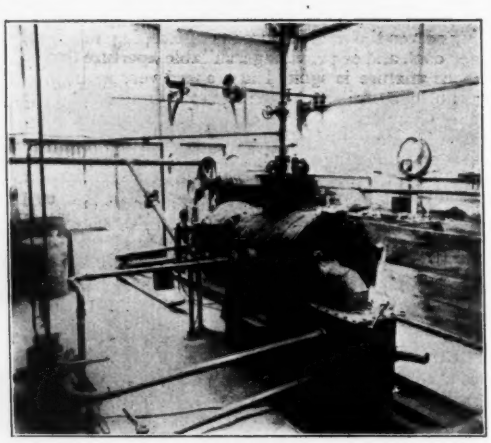
which, of course, depends upon the pressure at which the steam is being generated. This is a much lower temperature than that at which the products of combustion usually pass out of the tubes of a multi-tubular boiler. But in order to still further increase the efficiency of steam-raising, the products are passed through a short tubular feed-water heater constructed on the same principle as the boiler. In a test carried out when we were generating steam at 100 lbs. per square inch pressure above that of the atmosphere, the temperature of the products leaving the boiler tubes was 230° C.—the actual boiling point of the water being 170° C. We passed, as I have said, these products, still containing a certain amount of valuable heat, through the feed-water heater (which is only 1 foot long) containing tubes corresponding in number and diameter to the tubes in the boiler. Each tube was packed with granular material. The hot products, continually baffled in their passage through the tubes, readily imparted their heat to the cold feed-water surrounding them. We were thus able to reduce the temperature of the products leaving the water-heater to less than 100° C.

The Ten-Tube Boiler on which the Tests were Made.

I will now show you photographs of the 10-tube boiler with which we have been experimenting. You will notice that the pipes and connections for the supplying of the gas and air are rather crudely disposed, owing to the experimental character of the work.



View of the Front of Ten-Tube Boiler Showing Gas and Air Connections on which the Experiments were Carried Out.



View of the Opposite End of the same Boiler, showing Feed-Water Arrangement.

Had the boiler been in regular use for industrial steam raising, we should have arranged our supply-pipes differently. The connections consist essentially of a tube for the supply of the gas, and another for the supply of the air. The gas and air are mixed before entering the feeding chamber, which is attached to the front plate of the boiler; the gaseous mixture is burned in the tubes of the boiler; the products pass outwards at the other end into a small chamber and from there into the feed-water heater. The latter contains five or six tubes, each 1 foot in length and 3 inches diameter, which are filled with granular material to effect the exchage of heat. The second view of the boiler shows you the end with the feed-water arrangement attached.

Results Obtained by the Boiler.

With regard to the results achieved with this boiler. In our experimental station at Armley, there is no coke-oven gas or producer gas available; and therefore we have worked entirely on Leeds coal gas. But there is no doubt that had we been able to use the surplus gas from bye-product coke-ovens (which has practically the same calorific value as Leeds coal gas), we should have obtained the same efficiency as with the Leeds gas. The mixture of gas and air was passed into the feed chamber of the boiler at a pressure of 17·3 inches water-gauge. This pressure is necessary in order to overcome the resistance of the packing of the tubes to the passage of the gases through them. The pressure of the products entering the tubes of the feed-water heater was 2 inches water-gauge. So that the pressure necessary to force the gas through the zone of combustion, and thereafter through the remainder of the length of the tubes of the boiler was something like 15 inches water-gauge. In carrying out the test, the water was evaporated at a pressure of 100 lbs. per square inch above that of the atmosphere. The temperature of the boiling water was therefore 168° C. (or 337° Fahr.). The temperature of the combustion products leaving the boiler tubes was 230° C., or only 62° C. above that of the water in the boiler. The average temperature of the products leaving the feed-water heater was 95° C. (or 203° Fahr.). The temperature of the water entering the feed-water heater was 5·5° C. (or 42° Fahr.); and it was heated to 58° C. (or 136·4° Fahr.) before entering the boiler, entirely at the expense of the waste products leaving the boiler.

There are two points I should like to mention here. In the first place there is a very considerable natural circulation of the water in the boiler. This will be evident to you when I say that 65 per cent. of the total evaporation occurs over the first foot length of the tubes in the boiler. In the next foot length the evaporation is 25 per cent. of the total; and in the last foot length, only 10 per cent. As the result of this very steep "evaporation gradient" along each tube of the boiler, there is set up a vigorous circulation of the water, which undoubtedly is a factor in the rapid heat transmission obtained. I may perhaps remind you that the rate of evaporation per square foot of heating surface per hour in a locomotive boiler does not exceed 10 lbs. of water from and at 100° C. per square foot of heating surface per hour. In an ordinary Lancashire boiler, the rate of evaporation is something like 6 lbs. or 7 lbs. per square foot of heating surface per hour. With this boiler we can easily evaporate more than 20 lbs. per square foot of heating surface per hour. We are thus able to concentrate the evaporation into a relatively small space.

Let us now consider the heat-balance of the boiler during the test. The amount of coal gas fed into the boiler, expressed as dry gas at 0°C. and 760 mm., was 996 cubic feet per hour. The net calorific value of the gas was 562 B.Th.U. per cubic foot; so that the total heat supplied to the boiler in terms of the net calorific value of the gas was 559,800 B.Th.U. per hour. As to the amount of water evaporated, the following figures apply to the combination of the boiler with its feed-water heater, because the two really comprise one steam-raising system. The temperature of the feed water was 5·5°C; and the steam was being raised at a pressure of 100 lbs. per square inch above that of the atmosphere. The actual amount of water evaporated was 450·3 lbs. per hour, which in terms of water evaporated from and at 100°C. would be 550 lbs. per hour. The actual heat therefore transmitted to the water was $450{\cdot}3 \times 1172 = 527{,}800$ B.Th.U. per hour. The ratio between the heat transmitted to the water and heat supplied was, therefore,

$$\frac{527{,}800}{559{,}800} = 0{\cdot}943.$$

Analysis of the Flue Gases.

It is one of the outstanding merits of the new system that we are able to completely burn the gas with a minimum excess of free oxygen, and during the test in question the average proportion of carbon dioxide in the combustion products was as much as 10·6 per cent., while the oxygen was as low as 1·6 per cent. The most careful examination of the products failed to reveal the presence of the slightest trace of CO, H_2, or CH_4. Therefore the remainder of the gas was simply nitrogen. Even with as little as 0·5 per cent. of oxygen in the products, we obtain perfect combustion of the gas in the tubes; indeed, so long as there is any oxygen at all in the products, not a trace of gas escapes unburnt.

A Simple Construction.

I may now appropriately say a few words with regard to the construction of the boiler. We have been repeatedly asked whether there is any special mechanism inside the boiler which in any way accounts for the high transmission of heat obtained. I can answer this question simply by saying there is no mechanism whatever inside the boiler. It is merely a plain cylindrical boiler shell, traversed horizontally (or vertically, if it is preferred) by ordinary boiler tubes. There is no arrangement for baffling the water inside the boiler or for producing artificial circulation in any way. The very rapid circulation of the water in the boiler is produced naturally by what I have referred to as the very steep "evaporation gradient" along the tubes. In the second place, the boiler requires no elaborate system of flues and no brickwork setting; it is simply set upon castings, so that a man can creep underneath it. It requires no chimney. The gases are either drawn through the tubes by means of the suction of a fan, or pumped through under pressure. The actual power expended in thus drawing the gases through the boiler is something like 4 per cent. of the total power generated, so that the net efficiency will not be 94 per cent., but something in the neighbourhood of 90 per cent.

Rapidity of Steam Raising.

In the next place we are able to raise steam with great rapidity. Starting with the ten-tube boiler all cold, we are able to get steam at 150 lbs. per square inch pressure in about twenty minutes, and

we are able to continue the high rate of evaporation indicated—viz., 20 lbs. of water (from and at 100° C.) per square foot of heating surface per hour, so long as the gas supply is properly maintained. That is a very rapid rate of steam-raising; but it does not unduly strain the boiler, because of its short length. The tubes being only 3 feet in length, there is very little strain in the boiler, even if we force the boiler to an extremely high duty. We are able with a little sacrifice of efficiency—not more than 5 per cent.—to increase the rate of heat transmission in the boiler by something like 50 per cent. beyond the figures recorded in the test I have already referred to; so that if, in order to meet an "emergency" demand for steam, we have occasion to force the boiler so as to obtain an evaporation of up to (say) 30 lbs. of water from and at 100° C. per square foot of heating surface per hour, all we have to do is to force more of the gaseous mixture through the boiler-tubes.

Elasticity of the System.

Another merit which the boiler has is that we are able to arrange (in the case of a large boiler containing altogether 50 or 100 tubes) the tubes in groups; so that if the demand for steam were to suddenly fall off, the man in charge would merely have to shut off the gas from one group of tubes, and in a few minutes the generation of the steam in the boiler would be correspondingly reduced. Conversely, if at some later period there were a sudden call for more steam, an additional group of boiler-tubes could be lighted up, and in less than five minutes the maximum heat would be transmitted through their walls. We are thus able to respond very quickly to sudden demands either for increased or reduced power. This elasticity is a great advantage for many purposes, especially when the load is continually varying; and no system of coal firing is capable of such rapid adjustment to varying load requirements.

In the next place, the front of the boiler is thoroughly protected from being unduly heated—an important point in the firing of multi-tubular boilers. In the ordinary firing of multi-tubular boilers where the front plate is subjected to the high temperature of the gases passing into the tubes, there is always a liability of a giving way of the joints between the front plate and the tubes. In the new boiler, however, these joints are protected, and they are never at a temperature higher than that of the water in the boiler. They are therefore not subjected to any undue strain or wear, and there is no danger of leakage.

Having now reached the end of the descriptive part of the lecture, we propose to demonstrate, by means of the small three-tube boiler behind the lecture table, the new method of applying surface combustion to steam-raising. The boiler will be lighted up and started cold, and we shall hope to obtain steam at 115 lbs. per square inch pressure in about twenty minutes from the time of lighting up.

Most of the audience then came forward to the lecture table and examined with great interest the porous diaphragms, crucibles, furnaces, and other apparatus by means of which a few of the practical applications of surface combustion had been demonstrated. Mr. James Wilson gave a short demonstration of the brazing of copper by means of heat radiated from an annular bed of granular material maintained in a state of incandescence by surface combustion. Conversation was interrupted by Professor Bone announcing, eighteen minutes from the time of lighting up the boiler, that the steam had attained the 115 lbs. per square inch pressure. A large discharge of steam into the lecture theatre was sufficient proof of this; thus bringing to a close a memorable and historical lecture in connection with the new method of obtaining a high efficiency in gaseous heating.

The personal and professional friends of Mr. Vincent Hughes, the Gas Engineer to the Smethwick Corporation, and Past-President of the Midland Association of Gas Managers, will, we are sure, sympathize with him in the great bereavement he has lately sustained by the death of his wife, after a long illness.

Trouble is being experienced from the corrosion of the casings of certain bore pipes in the Coonamble district, in New South Wales. The bores concerned include one from which the town draws its water supply, and the matter has been brought to the notice of the State Government. At the instance of the Public Works Department, a consignment of wrought-iron pipes was obtained; the opinion being expressed that these would stand the bore water much better than the steel pipes previously used. A trial was immediately made with a length of 56 feet of wrought-iron casing, and after three months' use it was found that, far from being non-corrosive, the wrought-iron pipes are badly pitted inside. After a life of eighteen months, the steel casing of the town bore is in so bad a state that it is being pulled out. This subject of the corrosion of artesian bore casings was discussed by the Australasian Association for the Advancement of Science during its recent congress in Sydney. It followed the reading of a paper to the Chemical Section, on the corrosion of iron and steel, by Professor Fawsitt, of the Sydney University, who pointed out that while any water could be made non-corrosive by treating it with lime, such treatment was impracticable before bore water reached the bottom of the casing. The most practical method, in his opinion, was to prevent, by means of a layer of cement, the water from coming into direct contact with the metal casing.

A DISPLAY OF HIGH-PRESSURE GAS

AND OTHER THINGS.

People in the Midlands who are in any way interested in the application of high-pressure gas to lighting or industrial purposes may be recommended to pay a visit to the National Trades Exhibition which is now being held—and will remain open until the end of next month—at Bingley Hall, Birmingham. The exhibition is an annual affair (and the members of the Junior Associations will have an opportunity of seeing it when the joint meeting is held in Birmingham towards the middle of May). But this year it contains a specially good display of high-pressure gas lighting, which has been arranged by Mr. S. R. Barrett, the Fittings Superintendent of the Birmingham Corporation Gas Department. Various makes and types of high-pressure lamps are used—including those of the Keith and Blackman Company, Messrs. Thomas Glover and Co., the "Ukay," which is made by Messrs. Joseph Breedon and Sons, of Birmingham, the "Ovee," and the Graetzin.

The outside lighting of the main entrance to the exhibition is effected by two 3000-candle power Graetzin lamps. The lighting in the various bays of the exhibition hall, the machinery section, and the entertainment hall is by means of 37 "Ukay" lamps, 21 Keith lamps, and five Glover lamps—each of the 1000-candle power type; and there are two Graetzin lamps of 3000-candle power each over the auditorium in front of the bandstand. There is no glass fitted to any of them, but only a wire gauze screen under the lamp, to prevent any possibility of damage being done in the event of the fire-clay nozzles dropping from the burners. Around the galleries there are two 1000-candle power Glover lamps, ten 300-candle power Keith lamps, and 35 300-candle power "Ovee" lamps. "Ovee" lamps of the 300-candle power pattern are also used for the lighting of various stands in the hall. In connection with this scheme of lighting, a series of ventilators has been fitted in the various bays to secure the efficient ventilation of the hall; and so far as it is possible to judge from temperatures at present, the arrangement is working most satisfactorily.

The whole of the gas required is supplied direct from the Corporation high-pressure mains, which have been recently run up to Bingley Hall; and the lighting forms an exceedingly good illustration of the various types of high-pressure lamps which may be adopted for outside shop lighting, &c., or the illumination of large interiors, such as halls and factories. It has been installed really as an object-lesson to the people of Birmingham and the neighbourhood of the advantages of high-pressure lighting for different purposes. The ease with which installations of lighting of this character may be worked and controlled from different points is splendidly demonstrated when the illuminated fountain is brought into play during the evening—the whole of the central bays being turned down simultaneously when the fountain starts working, and immediately switched on again afterwards. The absence of the spluttering effect which was associated with the switching on of the electric arc lamps is marked. Each bay is separately controlled from the high-pressure gas-main; and a low-pressure supply is carried to each of the lamps for bye-pass purposes.

As to the show generally, the Birmingham Gas Department have a very attractive exhibit forming the four sides of a square, and divided in the centre. One side is devoted to high-pressure apparatus—muffles, furnaces, &c.; and there are shown in use various types of high-pressure blowpipes, soldering irons, &c. The stand is receiving considerable attention on the part of manufacturers in the jewellery and metal-melting trades. The other half of the stall is occupied with demonstrating the domestic uses of gas. In connection with the supplying of hot water, a Wilson circulator is fitted complete, and furnishing hot water to a lavatory basin, in connection with which there are also fitted a Fletcher-Russell instantaneous water-heater, and one of the Parkinson Stove Company's "Pearl" water-heaters. Over the bath a Maughan "Teba" geyser is fixed; and there are shown various types of cookers, both for hire-purchase and for simple hire, as well as a selection of gas-fires, radiators, &c. A special feature to be noted at the stand is the supply of literature, which is of a kind calculated to be of great assistance to the gas consumers. For instance, one is informed "How to Light a Gas-Fire," or is given "Hints on Gas-Burners," or is told "How to Use a Gas-Cooker." And there are also lists giving information as to the terms for fixing outside shop lamps, on permanent hire or other conditions. The stall is lighted by means of 48 inverted burners of 60-candle power, which are arranged round the top. Photographs of high-pressure apparatus are to be seen there, together with a view of the laboratories devoted to this branch of the business, which have recently been noticed at length and illustrated in the "Journal."

This year a greater number than usual of the general gas apparatus makers are showing at the exhibition; and they include Messrs. John Wright and Co., the Cannon Iron Foundries, the Parkinson Stove Company, the Davis Gas-Stove Company, the Richmond Gas Stove and Meter Company, and Messrs. Thomas Glover and Co. These firms make a good display of all kinds of gas fires, cookers, grillers, radiators, circulating boilers, &c. There are also several gas-engines to be seen in operation.

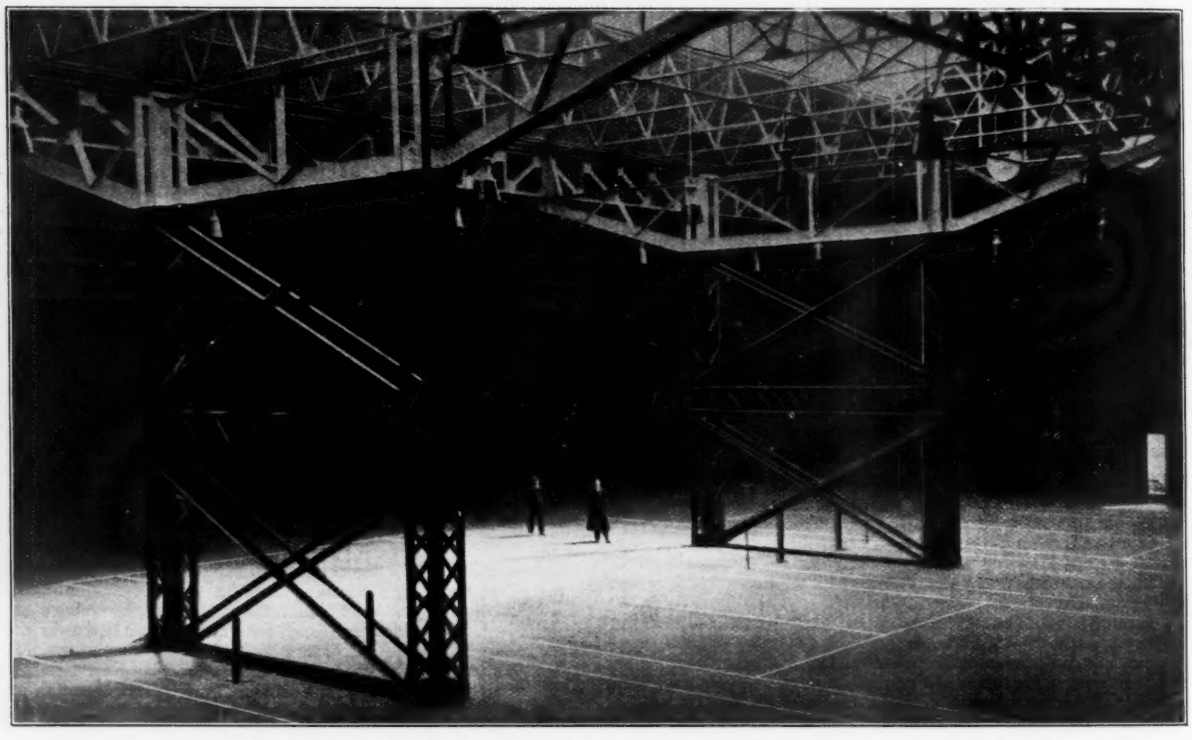
As usual, the exhibition is a most successful one—attracting crowds of people, many of whom go to see the high-pressure lighting and manufacturing appliances.

TENNIS BY HIGH-PRESSURE GAS LIGHTING.

Tennis players are happy at Dulwich, for they can now indulge in their favourite recreation there no matter the atmospherical conditions. Let the wind be never so boisterous, let there be torrential rains, or blizzards, or snow storms—all the same, they can play. Whether it be summer or winter they can play; whether it be day or night, they can defy the conditions—and play their game. This has been accomplished by the erection of the most spacious building in the world that has been laid out solely for tennis, and by having recourse to high-pressure gas lighting when Old Sol is off duty in that choice quarter of South London. The huge building is to be known as the home of the Covered Courts Club; and it is situated in the College Road, hard by Dulwich College. The application of high-pressure gas lighting for this purpose is novel; and as, following this example, covered tennis courts are likely to spring up in other parts of the country, our readers will like to know something about how the system has been applied. We have, therefore, to acknowledge our indebtedness to the Hon. Secretary of the Club (Mr. Percy W. Rootham, of No. 93, South Croxted Road, Dulwich) for the opportunity he afforded us on Saturday evening—the day of the opening of the new building—for making an inspection of the courts and the lighting arrangements. We are confident that any gas-lighting engineers who desire to make a similar inspection will be permitted to do so, by appointment with Mr. Rootham.

A Few Words about the Covered Courts.

When it is mentioned that the courts occupy a floor space of something like half-an acre, it will be recognized that the building is extensive. As a matter of fact between the walls it is, taking the inside measurements, 134 ft. by 158 ft. On the College Road side of the building, there is the main entrance hall. Turning to the left on entering, there are the dressing-rooms, fitted with washing and other conveniences, for the lady members of the club; to the right of the entrance hall, are the dressing-room, bath-rooms, and other conveniences for the gentlemen members. From the entrance hall, a gallery running the full length of the building is reached, from which spectators can watch the play in the great main hall. This is the place, with its three large courts, of central interest for us. And here a preliminary word of congratulation must be said to Mr. H. M. Rootham, Assoc.M.Inst.C.E., the designer and constructor of the building (who, by the way, is himself an ardent tennis player), on the conspicuous completeness of his design and arrangements for complying with the requirements of the fascinating game. Throughout, there is seen the scientific regard that has been paid to detail. The building is a white brick one relieved with red courses. The roof is carried on a steel structure, the supporting columns of which form the divisions between the three courts—the space between each court being 15 feet. The central longitudinal portion of the roof is glazed with suitable glass; and the two side portions (covered with red tiles) are lined on the under part and painted white. The design of the roof is such that during the day, there



The Gas-Lighted Covered Tennis Courts at Dulwich.

is an excellent diffusion of natural light, while the players are fully protected from any inconvenience from the sun. The floor and the walls are a dead-black, so that the rapidly flying white balls may be clearly seen.

Requirements in Artificial Lighting.

With dead-black walls and floor (which render no assistance in the way of reflection), it will be at once perceived by readers that here we have conditions, supplemented by the requirements necessitated by the sharp character of the play and the comfort of the players, that were not the easiest possible to meet in a scheme of artificial illumination; and they needed some amount of study. There was keen competition between the South Metropolitan Gas Company and the local Electric Company for the honour of carrying out the lighting, which presented an opportunity worth gaining. Gas won. And it is easily seen why it did so. What are the artificial lighting requirements for this purpose? The light must be soft, and yet good. It must be well-diffused and uniform over the whole of the courts—being as good at every extreme point as at the centre. There must be no flickering of the lights; steadiness is an essential. Therefore electric arc lighting was out of the question. There must be no glare; and the one of the two rivals which affects the vision least in this respect is gas lighting. Reliability is also a *sine quâ non*. Imagine what would be said if the light failed just as the players on three courts were in the midst of an exciting game. Arc lighting being out of the question, the electricians proposed to rely upon reflected lighting (to avoid glare), by fixing several battens along the roof, and using the Osram type of lamps. But internally the roof has had to be designed so as to obtain the best possible top lighting during daylight hours, and therefore reflection could only be obtained from the irregular side spans. How the electricians hoped to get a uniformly distributed illumination over the courts below by lines of Osram lamps and reflection from the roof is not plain. But that is a question that need not be discussed, as the cost of reflected lighting by Osram lamps put it altogether out of the running in comparison with what the South Metropolitan Gas Company could offer, with the conditions as to uniformity, absence of glare, and reliability all duly complied with. The installation finished, experienced players have expressed their admiration and satisfaction with its complete compatibility with their needs. Having seen the excellence of the lighting—softness, absence of glare, uniformity—we can appreciate their delight at being able to continue play when daylight fails and in any weather, under the nearest possible approach to daylight conditions.

The Installation.

In the building there are both high and low pressure gas-lamps, and gas-heated boilers for hot-water supply for baths and lavatory basins. The Gas Company, needless to say, have set about the work in thorough style. A special 3-inch main was laid to the building from the College Road. Outside the building is a little structure containing the gas-compressing plant and the meters—one for the high-pressure supply, and the other for the low-pressure; so that a precise account of the consumption of the high-pressure section of lighting can be kept. The high-pressure

gas is measured before passing through the compressing plant; and this plant occupies but little space in the "outhouse." It is very compact. It simply consists of a gas-engine, of slightly more than 1-horse power, coupled up to a small ("B" size) compressor, which looks quite capable of being picked up by a man without any special effort. But this small thing can pass 1000 cubic feet of gas an hour, at 81 inches pressure, into the high-pressure system, and that is the pressure at which the gas is delivered into the supply-pipes to the lamps over the tennis courts. The high-pressure gas is taken from the compressor-house by 2-inch pipes, to a cupboard inside the main entrance-hall, where the distribution-pipes are divided—a 1¼-inch pipe being carried to the apex of the roof above the three courts. The distribution pipes (in the cupboard in the entrance hall) are fitted with Keith diaphragm governors; and from this one point the gas-lamps over each court are controlled. Thus only the courts in use need be lighted up.

The Lighting of the Courts.

From the pipe in the apex of the roof, reducing pipes are run to the high-pressure gas-lamps. These are of the well-known Keith inverted type; each consuming 25 cubic feet an hour, and giving a light (without the reflectors and screens to be presently noticed) of 1500-candle power. In all, there are 24 of these lamps—eight over each court—suspended 25 feet from the floor. The ordinary price of gas in the South Metropolitan Company's district is 2s. 2d., so that it is easy to calculate from this that the total consumption of gas over each court per hour is 200 cubic feet, representing something like 6d. an hour. There was the question of supplying the courts with good uniform light, and at the same time shielding the eyes of the players and the spectators in the gallery. This has been accomplished by surrounding each lamp with a cone-shaped Chappuis reflector, the inside surface of which is of fluted, silvered glass. Below the reflector is suspended a ground glass screen, which overlaps the reflector 4 inches all round. The effect of this overlapping is to direct some of the light up to the ceiling, so that there is no gloomy part there, and the white surfaces of the side parts of the roof serve to reflect the light. Expert tennis players (as we have said) bear testimony to the fact that the character of the light is all that could be desired; and both from floor and gallery, we found that the light and the positions of the lamps caused no inconvenience to the sight.

The Low-Pressure Lighting.

Dealing next with the low-pressure lighting. In the gallery, there are four of Sugg's double-burner inverted lamps of 500-candle power each. These lights are also shaded from the players below, by, on the courts' side, a curved screen. The entrance hall is lighted by three of the Sugg double-burner lamps, and on either side of the doorway is a single "Metro" inverted burner. Outside the main entrance are two "South London" single inverted burners, and over the side entrances are two-light inverted lamps, carried on wrought-iron suspension arms. Whether the place is approached from Dulwich Common or College Road, the large building in the day is a striking object; and at night time the lights attract attention to it.

The New "Metro" Burner.

But we have mentioned the "Metro" inverted burner; and stay for a few descriptive words concerning the new-comer for internal lighting on which Mr. Charles Carpenter has been at work for some time—following the lines of the burners of the non-adjustable type that he designed for street lighting. The nipples of these non-adjustable burners, it will be remembered, are specially made for the quality of gas and pressure at which they are to work, so as not to require adjustment after being fitted. But that is not the only feature of this internal burner. Although of the inverted type, it is made so that it can be slipped apart for cleaning, with the greatest facility; and for this purpose the bayonet joint is utilized. The part of the burner containing the nipple is screwed on to the gas-fitting. Into the cap of this gas-injector part, the bunsen tube (carrying the hood of the burner) is simply slipped, and connected by a bayonet joint, being held secure by a small spring. The hood of the burner is of artistic design, and is made of Doulton ware, so that it will not tarnish or get unsightly from the heat. The steatite nozzle and mantle carrier are in one piece; and instead of the mouthpiece of the nozzle being open as is usual in inverted burners, it is rounded off like a thimble and perforated. The globe is also suspended by a bayonet joint. The burner (made in three sizes) is neat in appearance, and was doing excellent work at the Covered Courts Club on Saturday night.

Water-Heating by Gas.

This is a little excusable digression from the course of inspection, as this is the first time we have met the "Metro" internal burner. The gentlemen's bath rooms, dressing-room, and lavatories, are also lighted by it. The baths (fitted with sprays) and the lavatory basins are fed with hot water from a Potterton gas-boiler—the storage being equal to 50 gallons. This is an ample supply. The ladies' rooms are lighted in similar manner; but as there is no bath room, a Potterton boiler, with 25-gallon storage, is fitted for the supply of the lavatory basins.

A No Mean Part.

Here we have provision for indulging in tennis at all seasons and times under luxurious conditions; and in this provision, it will have been seen, gas takes a no mean part. The South Metropolitan Gas Company are to be congratulated upon the opportunity they obtained, in competition with electricity, for showing how covered tennis courts should be lighted.

While dealing with the lighting and hot-water arrangements of these covered tennis courts, there is an interesting point associated with them. The huge building stands on ground forming part of the estate of the Toksowa Hotel, Dulwich Common. An annexe to the hotel is being built; and the South Metropolitan Company are also providing the lighting for the 54 bedrooms (two lights in each), and all the domestic illumination. In each bedroom, a Wright gas-fire is being fixed; and Potterton's hot-water circulating system is being fitted for the supply of the baths and other purposes.

GAS AT THE NURSING EXHIBITION.

The holding last week of the Fourth Annual Nursing Conference and Exhibition at the Royal Horticultural Hall, Westminster, afforded the Gaslight and Coke Company still another opportunity (of which they were not slow to avail themselves) of directing the attention of those connected with the medical profession to the particular advantages of gas from the point of view of the doctor and the nurse. The brightest corner of the hall—thanks to the brilliant lighting of the stand—was devoted to gas and its uses; and an excellent array of modern appliances there was. On one side was to be seen a Planet cooker, with extended hot plate, fitted in a recess, and having a plate-rack above. Over this was a hand pointing to a Wilson circulator at the side; and near the hand appeared the words: "The nurse's friend. Gas-heated hot-water circulator. Hot water day and night." Turning to the other side of the stand, there was noticed a fitted Fletcher-Russell "Tokio" fire, with one of the firm's well-designed overmantels. Above the fire was written: "The invalid's comfort. Bed-room gas-fires. Even temperature day and night." In addition there were, ranged round on ledges, many representative types of fires—among which may be mentioned those of Messrs. Fletcher, Russell, and Co., Messrs. John Wright and Co., the Parkinson Stove Company, the Richmond Stove and Meter Company, and the Carron Company. A useful article for medical men, to which attention was drawn, was the "Normandy" water distiller of the Thames Iron-Works Company. Then there were the Maughan "New Teba" geyser; Richmond's "Clyde" griller on stand, nickel plated, with white enamelled interior, and having a boiling-burner at the side; Fletcher-Russell's "Floresta" radiator, with argand burner and ruby chimney; and the quick-boiling kettle, which is fitted with a patent economizer or jacket, and is claimed to boil water in one-third less time than is taken by the same kettle without the addition of the patented arrangement. Numerous laboratory appliances by Messrs. Fletcher, Russell, and Co. were on view—a sterilizing oven, a furnace for organic analysis, a crucible furnace, a plate dryer and heater for dentists' use, and bunsen burners both for laboratory and general work. The main lighting was carried out by Podmore lamps and Sugg "Swanley" lamps without globes; there being also a number of "Nico" inverted gas-burners. The Podmore lamps were provided with the "Telephos" attachment; and the other lights were connected with pneumatic switches. Other things that attracted attention were the incandescent light, with lens, specially adapted for doctors and dentists; handsome standard lamps and silk shades; and some Hands modern art fittings.

The Family of the Late Mr. H. Rothwell.—It may be remembered that Mr. Harry Rothwell, of the Gaslight and Coke Company, and one of the London County Council's assistant visiting teachers of "Gas Supply," met with an accident early last December while giving instruction in the Westminster Technical Institute, from the effects of which he died. A claim was made to the Council on behalf of his widow and eight children; and at the meeting last Tuesday the Education Committee recommended the grant of £300, to be paid into the County Court, and to be dealt with by the Court in the interests of the parties entitled to it. The recommendation was passed.

North British Association of Gas Managers: The Young Memorial Lecture.—The Committee of the North British Association of Gas Managers have fixed the annual meeting of the Association to be held in Glasgow on Thursday and Friday, the 7th and 8th of September. This is the Jubilee year of the Association. Mr. G. Keillor, of Broughty Ferry, the President, intimated at the dinner on Wednesday after the Informal Meeting, that the Council had arranged with Dr. Colman to deliver the first of the lectures to be provided out of the William Young Memorial Fund; and they also proposed to ask Dr. Alfred Daniel, who was very intimate with Mr. Young, to write an appreciation of his life and work, for inclusion in the "Transactions" of the Association. We have received from Mr. Keillor a letter bearing out the preceding statement, and enclosing a copy of the letter addressed to Dr. Colman. The Council suggest to him that, in view of what Dr. Daniel will probably do, he might deal with the subject of the carbonization of coal as being the most important one at present before the gas industry. The next meeting of the Association consequently promises to be one of unusual interest.

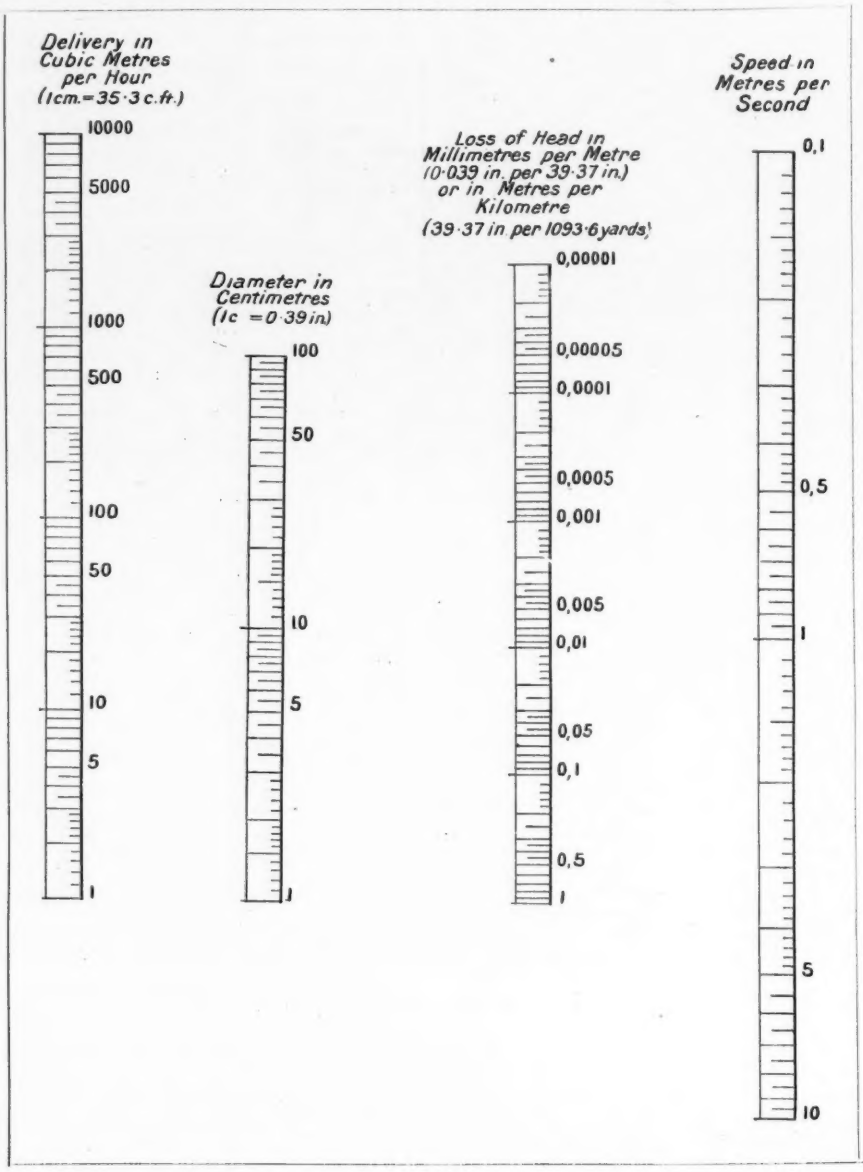
CALCULATING THE FLOW OF GAS IN PIPES.

An Abacus by M. Grebel.

THE increased attention which has of late been given by French gas engineers to the supply of high-pressure gas, and the completion of several installations by prominent members of the gas profession across the Channel, have aroused fresh interest in methods of facilitating the calculations for determining the size of mains necessary to give the required output. Up till comparatively a few years ago, there were in existence in France only the tables of M. Arson, published in 1867, and the diagrams of M. Monnier, which appeared in 1876. There were certain inconveniences attending the use of these diagrams; and it occurred to M. André Grebel—a French civil engineer whose name has frequently appeared in our columns in connection with papers read by him before the Société Technique, or with articles in our French scientific contemporaries—to construct for gas-pipes an abacus based on the system of parallel co-ordinates devised by M. d'Ocagne. In carrying his idea into effect, it was first of all necessary to select a formula; and on this point he was in entire agreement with M. Monnier. The essential data connected with the problems of the flow of gas can be known only approximately. Preference should therefore be given to the most simple formulæ, without seeking to attain, at the cost of unjustified complications, a degree of precision which the problems themselves do not permit of attainment. The formula on which M. Grebel based his abacus was—

$$Q = 1\ D^{\frac{5}{2}}\ H^{\frac{1}{2}}.$$

The flow of fluids in large pipes can only be the object of empirical formulæ, applicable solely in the limits within which they



have been verified. One can admit, with Coulomb, that the loss of head H in a rectilinear and horizontal pipe is represented by the formula—

$$(1)\quad H = \frac{4L}{D}\,(a\,V \div b\,V^2)$$

in which L is the length of the pipe, D its diameter, V the average speed, while a and b are numerical coefficients. With regard to the delivery, it is expressed by the ratio—

$$(2)\quad Q = \frac{\pi D^2}{4} \times V$$

Neglecting V in the first formula, Q may be put in the following simple form—

$$Q = K\sqrt{\frac{H\,D^5}{L}}$$

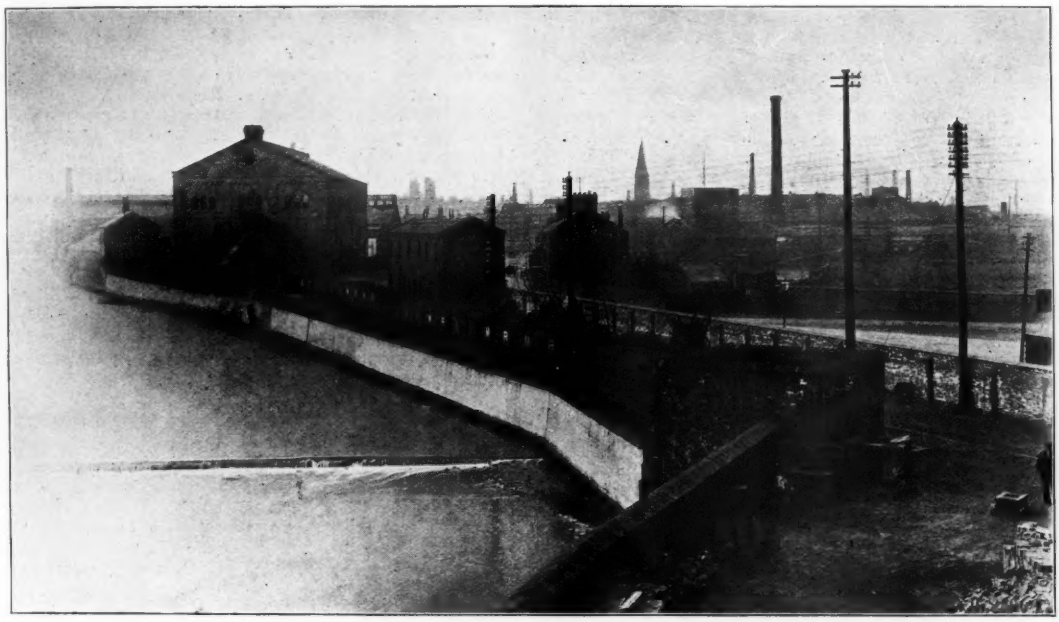
This is the formula presented in 1827 by D'Aubuisson; and it was adopted by Monnier in France, Schilling in Germany, and in "King's Treatise on Coal Gas" in England. The values of the coefficient K given by Girard (0·845), Mayniel (0·860), Schilling and Monnier (1·091), and in "King's Treatise" (1·12), are fairly near unity, with the exception of the first two, which are acknowledged to be too low. Practical experiments made upon a high-pressure main rather more than four miles long and 3 inches inside diameter gave values for K about 1.

By the courtesy of M. Grebel, we have been able to reproduce his abacus (which is now out of print), and, from particulars supplied, to give the following directions for its use: To make a reading, place a rule upon the abacus. The four points of intersection of the four axes with any line will give the values of the four corresponding elements of a pipe—viz., delivering capacity, diameter, loss of head, rate of flow. The position of the right-hand secant is determined when the value of two of these elements is known. The divisions of the abacus are analogous to those of a slide-rule—*i.e.*, logarithmic.

In the case of water gas, the loss of head is 1·4 times greater than that given by the abacus; with compressed air, it is 2½ times; and with acetylene, 2¼ times greater.

A DAY AT BURTON-UPON-TRENT WITH THE MIDLAND JUNIOR GAS ASSOCIATION.

An early start was necessary for those members of the Midland Junior Gas Engineering Association who intended to take part in the whole of the programme last Saturday which had been arranged for them by their President, Mr. R. S. Ramsden, to whose home—Burton-upon-Trent—the outing was made. For all there was to be seen and to do, a full day proved to be none too much; and every minute that was spent in the town was either enjoyable or instructive—and generally both.



General View of the Burton-upon-Trent Gas-Works—Taken from the Tank Platform of the New No. 1 Gasholder.

Those who were able to get away during the morning from their respective spheres of labour, reached Burton at about half-past nine, where they were met by the President, and at once started off with the first visit of inspection, which was to the world-famed brewery of Messrs. Bass, Ratcliff, and Gretton, Limited. These works and stores occupy a tremendous amount of space in the "Capital" of the brewing trade; and quite an appreciable portion of the three hours or so spent under the charge of the courteous officials of the firm was passed in a private railway train, which conveyed the members from one point to another. Founded in the year 1777, the business of the firm has gone on growing, till to-day there are directly in the service of the Company no less than 4000 employees, who fill the positions of managers, clerks, brewers, maltsters, labourers, &c.; while a very much larger number than this are, of course, indirectly employed as farm labourers, railwaymen, mechanics, engineers, stevedores, &c. Some idea of the extent of the operations carried on will be gathered from the fact that the firm pay over half-a-million pounds per annum to the Imperial and Local Authorities, in the shape of excise, licence duty, income-tax, rates, &c. The steam cooperage was first visited; and it was seen how much work is entailed in the making of a barrel. It would be difficult to say just how many different machines are requisitioned in the operation; but the number is large—hand labour being reduced to a minimum. A feature of the installation (which is capable, working ordinary hours, of turning out about a thousand new casks a week) is the fact that all the shafting is underground. Gas has its part in the process; for the stamps with which the barrels are branded are heated by means of bunsen burners. Of the various operations of brewing to which the members were introduced, and the care with which the hops are stored, it is unnecessary to speak here; but it may be remarked that, under the tutelage of the officials, they learnt as much as was possible in a single morning of how beer is made. The visit was a somewhat unique one for a Gas Association; and the kindness of the firm in permitting it was greatly appreciated.

After lunch at the White Hart Hotel, a move was made by the visitors (largely swelled in numbers by the arrival of the afternoon contingent) to the electricity works of the Corporation, where further useful information was gained from Mr. T. Hall, the Electrical Engineer, and his assistants. These works, which were erected in 1893, are situated on the north side of the gas-works, the sidings from which extend to the power station—thus affording ready means of getting in coal supplies. The engine-room is under one roof, and the boiler-house under another; the boiler-house pipe-work being as near to the engine-room as possible, so as to obviate long lengths of steam-pipes and their attendant condensation losses. The water required for boiler-feed purposes is first pumped from the River Trent, by means of donkey pumps, into an overhead tank, where it is heated to about 100° to 120° Fahr. by exhaust steam from the auxiliary engines, and at times by live steam. After this the water gravitates to a softening plant; being controlled automatically by a ball-cock in the suction tank. It may be pointed out that the hardness of the water is 26 deg.; but after treatment with caustic soda, this can be reduced to 7 deg. As a matter of fact, the working hardness is about 12 deg. From this plant the water is pumped into the boilers by weir feed pumps through the economizers, where it is heated again by means of the waste flue gases; the economizers consisting of a number of tubes, placed in the path of the gases, through which the water circulates. There are six Lancashire boilers—three with forced-draught furnaces, hand-fired, and three fitted with Bennis mechanical stokers. The engine-room contains eight main generating engines, with their auxiliaries; and two supplies of current are always being generated—one for lighting only, the other for tramways. The lighting current is single phase, alternating; and the line voltage at the works is 2000. For the tramways, the current is continuous; the line voltage being 500 to 550. From two switchboards, the cables are taken to different centres in the town, where the current is transformed to a voltage suitable for the consumers.

The inspection of the electricity works having been concluded, the party stepped across to the gas-works; being intercepted while doing so by a photographer, who claimed their attention for a few minutes.

THE GAS-WORKS.

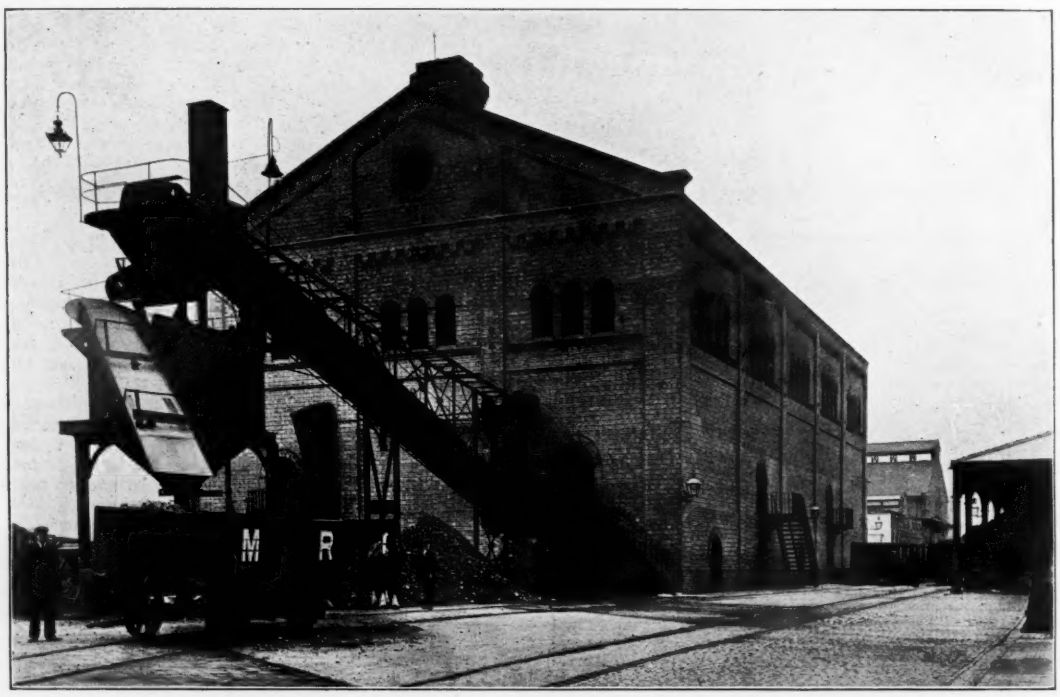
At the entrance to the gas-works, the visitors were taken in hand by Mr. Ramsden (the Assistant Manager), Mr. C. P. Mudie (Chief Assistant), Mr. A. E. Ruffhead, Assoc.M.Inst.C.E. (who acted as Clerk of the Works for the new retort-house), Mr. F. Fletcher, Mr. F. Newman, and other members of the staff. Mr. J. F. Bell, of Derby, who is Consulting Engineer to the Burton Corporation, was unable to be present, but was represented by Mr. W. E. Caton, the Assistant Engineer to the Derby Gas Company, who is a Past-President of the Association.

The gas undertaking, it may be remarked, was originally established in 1832, with a capital of £3000, but came into the possession of the town in 1854. If operated to their fullest extent, the works would be capable of producing about 2¼ million cubic feet of gas per day, which leaves a good margin over the present requirements. The authorized area for the supply of gas, in addition to the whole town, extends also 1 mile in every direction beyond the borough boundaries. The gas and the electricity works, though under the same Committee, are under entirely separate management; and, as the visitors noticed when passing through the town, the gas undertaking has so far retained practically the whole of the public lighting, which is carried out by means of upright and inverted incandescent burners. As a matter of fact, there are to be seen among the street-lamps one electric arc and two metallic filament lamps; but these have been erected more by way of furnishing "samples" than anything else. There are some very good installations of incandescent gas lighting fitted up in shops, &c., throughout Burton; and among these may be specially mentioned the Market Hall. Here, rings of flat-flame burners were at one time used, which were later on superseded by electric arc lamps. The stallholders would, however, have none of these

latter, so the flat-flame burners were reverted to. This was the state of affairs existing some months ago, when Mr. Ramsden took the matter in hand, and put in a number of "Dacolight" five-light inverted lamps; and the lighting effect of these is so excellent that nothing but satisfaction with them is expressed.

To come to the gas-works themselves, these occupy about 7 acres of land, and are bounded on one side by the River Trent. Railway sidings run through the whole length of the works, and are in close proximity to every building. There are two retort-houses, one of which was erected as recently as last year; and this house was the principal object of interest to the visitors, inasmuch as it may fairly be claimed to represent the latest principles of carbonization on the horizontal system. Before referring more in detail to this new house, some other portions of the plant may be briefly touched upon—and first of all, the new gasholder which was described in detail by Mr. Ramsden in the course of the Presidential Address which he delivered to the Midland Junior Association last October.* This holder, which was constructed by Messrs. Clayton, Son, and Co., to the drawings and specification of Mr. Bell, has four lifts (one flying lift); and it is of a capacity of 1,100,000 cubic feet. Additional storage accommodation is provided by two older holders, which have a combined capacity of a million cubic feet. The second retort-house (equal to an output of a million cubic feet per diem) has nine beds of eight through retorts in three tiers—22 inches by 16 inches by 18 feet long. There are Klönne regenerators and furnaces on one side; and the stoking is all done by hand. Coal can be unloaded on to a dock at the end of the house.

As to the other plant, there is a horizontal water-cooled condenser, consisting of twelve 14-inch cast-iron pipes, about 19 feet long; and a condensing box 18 feet high by 4 feet square. Two tower-scrubbers, 7 feet diameter and 20 feet high, are sprayed with ammoniacal liquor. For the exhausting plant, there are two Cornish boilers, with Victoria furnaces for burning breeze dust, and a 15 H.P. and a 12 H.P. steam-engine (the latter as a stand-by); the three belt-driven Waller exhausters being respectively of 100,000, 80,000, and 40,000 cubic feet per hour capacity. There is a "Standard" washer-scrubber of a capacity of 1½ million cubic feet a day, fitted with wooden bundles, and a Cockey horizontal 2 million feet washer. Oxide of iron only is used for purification. No. 1 set of purifiers consists of four boxes 22 feet by 15 feet by 4 feet, on the ground floor, with a Newton Chambers hydraulic centre-valve. In No. 2 set, there are four overhead boxes, 30 feet by 17 ft. 6 in. by 4 ft. 4 in., fitted with a Cockey's dry-faced centre-valve. For this installation there is provided, for raising the oxide, a steam-driven bucket elevator fed by a spiral conveyor on the ground floor, and delivering on to a similar conveyor above the boxes. The two station-meters are of 10,000 and 20,000 cubic feet per hour nominal capacity; and there is a Livesey type naphthalene washer of a capacity of 2 million cubic feet per day. Occasionally the gas is enriched by means of a Maxim-Clark benzol carburettor, which can be connected to the outlet of either the station-meter or the governor. The ammonia plant and process were described by Mr. Ramsden in a paper which he read before the Association in 1908.* Briefly, the tar and ammonia are pumped from an underground tank to a storage tank near the plant, where the liquor is treated with lime, concentrated, and sold to chemical manufacturers.



Gable End of the New Retort-House, showing the Inclined Coke-Conveyor, Breeze-Hopper, and Coke-Loading Shoot.

The new retort-house, of which the accompanying illustrations are photographs, was erected, in accordance with the designs of Mr. Bell, on the site of four old houses which contained 150 direct-fired retorts. Its capacity is 1½ million cubic feet a day; but it has been designed so as to permit of extension, when required, to provide double this output. The house is built almost entirely of brick, and is 114 ft. 6 in. long and 64 feet wide. There are ten beds of eight through retorts in four tiers—22 inches by 16 inches by 22 feet long; and the firing is on the Klönne regenerative system, with furnaces on one side. The clinkering floor is on the yard level (and is particularly commodious and well ventilated); and the charging floor is above. The reason for adopting this course was the water-logged condition of the ground. It not only saved trouble in connection with the foundation work, but it prevents difficulty with flooding.

The charging and discharging are carried out by the aid of De Brouwer machines; 14½ cwt. charges of twelve hours' duration being worked at the present time. Seven-inch ascension-pipes are provided on each side; experience at Derby having shown that, with the ascension-pipes on one side only, it was impossible to completely fill the retorts, whereas having them on each side enables the gas to get away readily from a full charge. The gas enters the hydraulic main through Simmonds anti-dip valves, which, however, are closed, and the dip-pipes sealed, about 1½ hours before opening the retorts. Separate gas take-off pipes from each bed enter the collecting main, which is connected to the foul main, in two places, through 10-inch Carpenter retort-house governors, which are found to work very satisfactorily. In fact, Mr. Ramsden exhibited a recent diagram showing an extremely steady line throughout the twenty-four hours; and he assured the visitors that this was a fair sample of the regular working. There are continuous hydraulic mains with separate compartments to each bed, connected by a 4-inch tar-main to tar-towers. The foul main, laid with a fall towards the bench, is carried round the walls of the house to the condensers; the gas passing then through the two small tower-scrubbers before reaching the exhausters. After leaving the station-meter, the gas passes through the naphthalene washer, where it is treated with solvene, by Mr. Bell's process.

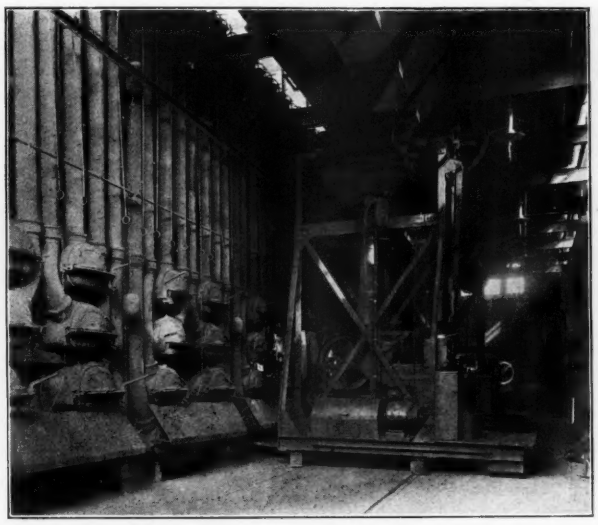
As to the coal and coke plant, the whole scheme has been devised so that from coal in the railway waggons to coke in waggons or carts, no handling is required; and it is all electrically driven. The capacity of the coal-handling plant is 50 tons per hour. The waggons are first automatically tipped at one end by a Jenkins waggon-tipper; the coal then falling on to a jigging feed, and thence to a jigging screen, which bye-passes the small—the remainder passing through the breaker below, and all ultimately falling into the elevator boot. The coal is then carried by one of the Chain Belt Engineering Company's bucket elevators and delivered on to a push-plate conveyor by the same firm, which discharges it into ten continuous hoppers above the beds in the retort-house. From these, weighed charges are drawn into the 1-ton hopper on the charging machine.

The coke is pushed out of the retorts by means of a Jenkins-

* See "JOURNAL," Vol. CXII., p. 127.

* See "JOURNAL," Vol. CI., p. 351.

The New Retort-Bed under Construction.



The Charging Side of the New Retort-Bed.

De Brouwer discharging machine on to a De Brouwer hot-coke conveyor, where it is partly quenched by hand. This conveyor is continued outside the retort-house as an inclined conveyor, which contains quenching sprays, with bottom doors for delivery on to the coke-heaps in the yard. Otherwise the coke passes to the top, over a shaker screen, with breeze-hopper below, and thence down a swivel shoot, which delivers it into railway waggons on either side. The conveyor in the retort-house is covered with hinged lids, which are raised before discharging takes place. Mr. Ramsden says he believes there is only one other plant in this country where a similar plan has been adopted; but it adds to the tidy appearance of the place, and also probably facilitates the firing of the furnaces.

In connection with this coal and coke handling plant, the unusual method has been adopted of buying the current from the electricity works. But from comparison with other towns, it is found that the power costs are no higher at Burton by reason of doing this. They amount roughly to 2d. per ton. There is a motor generator by the Brush Electrical Company for converting the Corporation 2000-volt alternating current to 220-volt direct current for driving the eight motors in use; and in case of any mishap to the ordinary town supply, arrangements have been made for obtaining current, through a transformer, off the tramway system, which, as has already been noted, receives its supply from separate machinery at the generating station.

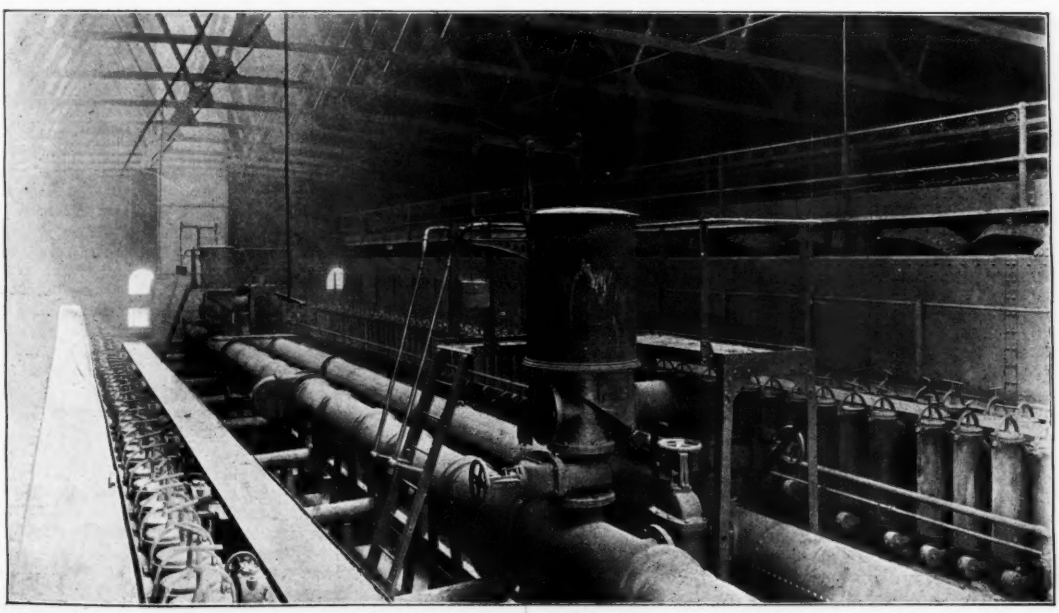
The following additional particulars of special features in connection with the new retort-house may be noted. The outside size of the coal-breaker and waggon-tipper pit is 31 feet by 26 ft. 6 in. by 25 ft. 6 in. deep. The site being close to the Trent side, and gravel being met with at 6 feet, continuing to a depth of some 25 feet, necessitated the sinking of a 30 feet well near the pit. By this means, the excavations were pumped dry as the work proceeded; and, finally, agricultural land drains were laid all round the outside and below the foundation level. These drains, connected to the well, rendered it possible, by continuous pumping, to allow the concrete and brickwork to thoroughly set before testing for water-tightness. A layer of concrete (1½ clean gravel, 1½ granite chippings, 1 sand, and 1 cement) was laid 12 inches thick over the whole site, on which an outside wall of Staffordshire brindled bricks in cement was built one brick thick, scaffolding high. The sides and floor were then lined with two coats rendering of 1 to 1 cement, ¾ inch thick, against which a two-brick inner wall was built of the same material, floated, and grouted solid. The outer wall was then carried higher, rendered, and lined as before; and finally the floor was covered with another 2 feet of concrete. All inner walls were built of ordinary brindled bricks or 6 to 1 concrete.

The stage floor of the retort-house is carried on white glazed brick arches, between steel joists. As to the retort-bench, there is concrete over the whole site, varying in depth from 1 ft. 8 in. to 5 feet, and strengthened where necessary with layers of old railway metals. The concrete under the feet of the buckstays is reinforced by crossed layers of scrap steel bars.

Mr. Ramsden remarked that the visit had taken place a little earlier than he would really have wished, because there were a number of details still to be completed. Various stacks of broken bricks and similar material were lying about the yard, which he pointed out were being kept in reserve for foundation work, &c., which is in contemplation.

Leaving the gas-works, a return was made to the White Hart Hotel, where the visitors sat down to tea, on the invitation of the Corporation Gas and Electricity Committee; those present including the Mayor (Councillor Jenkins) and Councillor Livens.

Mr. R. J. Rogers proposed a vote of thanks to the Committee



Top of the Retort-Bench and Continuous Hoppers.

for allowing them to go over the works under their control, and for their hospitality. They had, he remarked, enjoyed a very comprehensive visit—something more than the customary gas-works inspection. It was a happy thought on the part of the President to secure permission (for which they thanked the firm) to go over Bass's Brewery. Referring to Mr. Ramsden, he could only say the Midland Junior Association were proud to have him as their President; and they were delighted to have an opportunity of seeing the new retort-house and the other apparatus of which he had control. Having seen it, they were confirmed in the opinion they had always held of Mr. Ramsden—that he thoroughly understood his business. They were also glad to have had a chance of inspecting the electricity works; and they greatly appreciated the kindly spirit in which they had been met, and which seemed to permeate the working of the two businesses of gas and electricity in Burton.

Mr. W. H. Johns, in seconding, remarked that the new retort-house and gasholder were a credit to all who had anything to do with the work. A most interesting thing was to see electricity being used in gas-works to-day. It was a noteworthy fact that electricity was assisting gas managers to turn out their product more cheaply than it could formerly be made.

The vote having been carried by acclamation,

The Mayor, in acknowledgment, said he was pleased on behalf of the Corporation to welcome their Association. Burton had always been known as a hospitable town; and they desired to retain this character. It was a pleasure to him personally to come and meet the members and support his friend Mr. Ramsden. Of course, Mr. Ramsden was young yet. But he was a man for whom they in Burton had the greatest respect, and in whom they had the highest confidence; and his actions and his work up to the present had not betrayed this confidence. In conclusion, he expressed the hope that the information the members had derived, and the works they had seen that day, might be of some benefit to them in their future careers.

Mr. Ramsden thanked the members for the kind way in which they had shown their appreciation of the visit. He was pleased to have them at Burton; and he was also delighted to have the Mayor and another member of the Council present at tea. Alderman Lowe, the Chairman of the Gas and Electricity Committee, wrote regretting that he could not be with them in body, though he would be so in spirit. Other members of the Council had also expressed their sorrow at not being able to attend. Then he had received a letter from Mr. Bell asking to be excused for being absent, but stating that he had arranged with Mr. Caton to represent him. Mr. Bell continued: "I know the members of the Midland Junior Association will receive a cordial welcome to Burton, and trust you will have a most enjoyable and successful meeting. I have not willingly absented myself from your meetings; but you know latterly my time has been pretty well occupied. I read, however, your proceedings from time to time with much interest and pleasure; and it is very gratifying to see the interest and enthusiasm shown by the members generally of the Midland Junior Association. I consider many of the papers read at your meetings, along with the discussions, indicate high intellectual powers, with a grasp of the subjects discussed. I am convinced good work is being done by the Association; and you have my best wishes for its continued prosperity. Perhaps I may be allowed to congratulate you upon the able manner in which you have discharged your duties as President, and am sure the members will join me in wishing you every success in the future. It has been a pleasure to me to be closely associated with you—may I add, with pardonable pride?—in the successful management of the Burton Corporation gas undertaking, which is very largely due to your skill, untiring efforts, and industry."

Mr. W. E. Caton said he was very pleased to have an opportunity of coming among the members once more. The visit had been a most enjoyable one; and they would all agree with what had been said—that the extensions and improvements recently carried out at the gas-works were a credit both to Mr. Bell and to Mr. Ramsden.

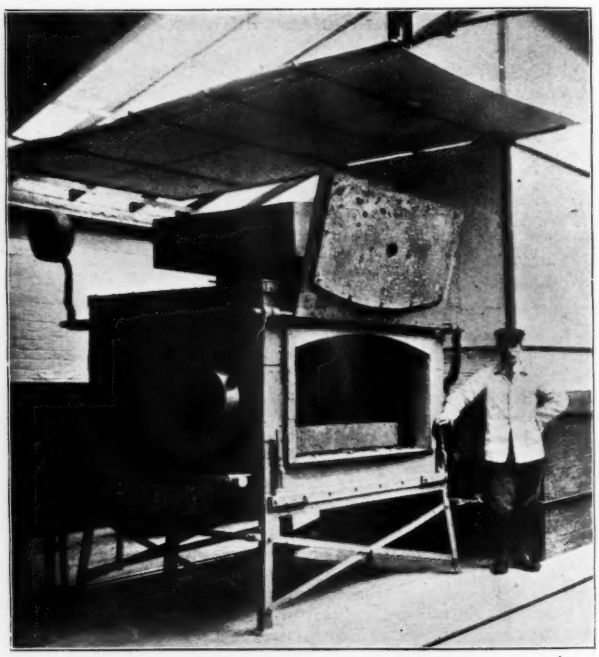
Some time was spent in music and song before the hour arrived at which it was necessary for the members to separate, after an outing in which all present were pleased that they had been able to take part.

At the meeting of the Institution of Mechanical Engineers on the 28th inst., Mr. J. Emerson Dowson will read a paper on "Gas-Producers;" and one on "The Effect of Varying Proportions of Air and Steam on a Gas-Producer" will be submitted by Mr. E. A. Allcut, M.Sc., late Bowen Research Scholar in the University of Birmingham.

The production of natural gas in the United States in 1909, as ascertained by a joint canvass made by the United States Geological Survey and the Bureau of the Census, is valued at £11,000,000—an increase of only about £72,000 over that of 1908. For the year 1910, the total production is estimated at £11,400,000. During 1910, a feature of great interest was the development of what promises to be a very large supply of natural gas in the Buena Vista Hills, Kern County, California, east of the Sunset-M'Kittrick oil-field. Arrangements were made and practically completed during the year for piping this gas to Bakersfield and other towns in San Joaquin Valley.

CREMATING DOGS BY GAS.

Though perhaps no very large demand can be expected to arise for gas for the purpose of cremating dogs, it is interesting to note that at Battersea, in the well-known Home for Lost Dogs, there does exist a gas-furnace installation having this object in view. And so successful has been the first furnace which was put in, that a second, on a slightly smaller scale, has now been erected. This was under trial last week, when a representative inspected the apparatus, through the courtesy of Mr. Guy H. Guillum Scott, the Secretary of the Institution. Before referring in detail to the furnaces themselves, however, it may be well to explain—in order to obviate any possibility of shock to susceptible readers—that it is only the dead bodies of dogs which the gas is called upon to deal with. Many of the animals collected and brought to the home remain unclaimed; and after a certain time has elapsed, such of them as are not likely to find a purchaser have of necessity to be destroyed. But this is done in a most humane manner. The dogs are placed in an air-tight chamber, where they are first dosed with chloroform vapour of gradually increasing strength, which is forced into the compartment; and then when they have become totally unconscious, they are asphyxiated by means of carbonic acid gas.



The Crematorium at the Battersea Dogs' Home.

When they are dead, the bodies still remain to be got rid of; and for this purpose, Messrs. Fletcher, Russell, and Co., of Warrington (through Messrs. Richardson and Co., lethal chamber manufacturers), some time ago erected a blast-oven furnace, with which, it is claimed, with air under a pressure of 1 lb. to 1½ lbs. per square inch, a better duty is obtained from the gas consumed than it is possible to secure by any other method. It is very similar in construction to the furnaces that are used in large industrial works. The burners, eight in number, are of the well-known injector type, which is a great improvement on the old style of blast burner. Each burner consumes about 120 feet of gas per hour, with air supplied at a pressure of from 1 lb. to 1½ lbs. per square inch. There is a tap on both gas and air inlets to each burner. Thus it is possible to regulate the furnace, which can be set to maintain a given temperature, without the aid of a governor on the gas supply, for any length of time. The floor of the furnace consists of 1½-inch clay slabs, on which a wrought-iron tray is placed, containing the bodies to be cremated. The products and the waste gases are carried away, through a series of flues on the top of the oven, into a stink chamber above; and from this they pass to an ordinary chimney shaft. With the furnace, which is in every way of most simple construction, it is possible to attain a temperature of over 2000° Fahr. in an hour to an hour-and-a-half. By way of furnishing "results," it may be mentioned that 58 dogs have been cremated in about 2½ hours, with a consumption of 4050 cubic feet of gas. Probably the gas-oven now referred to was the first to be made for this particular purpose; but others of the same type have, of course, been supplied to hospitals.

The pressure-blower used, which was made by the St. Pancras Iron-Works Company, when running at about 400 revolutions per minute, will deliver 1200 cubic feet of air per hour, at 2 lbs. pressure. This blower is driven by a 2·2 H.P. Capel gas-engine; and the supply of gas required for the installation is received from the Gaslight and Coke Company through a 300-light dry meter.

THE PATENT OFFICE IN 1910.

The Twenty-Eighth Annual Report of the Comptroller-General of Patents, Designs, and Trade Marks, for the year 1910, which bears the signature of Mr. W. Temple Franks, has lately been issued; and it shows that the period dealt with was a busy one for the office.

Inventors occupied themselves, as usual, with all kinds of problems; but their efforts were directed much more largely to some than to others. Subjects which are prominently before the public are naturally favoured with a lot of attention by patentees; and therefore it is not surprising to learn that in 1910 locomotion in general was undoubtedly the most prolific source of invention—"particularly now that aviation may fairly claim to be considered as part of it." Of course, airships and aeroplanes have been suggested as valuable engines of attack in time of war; and therefore inventors have been engaged on the design of guns and projectiles suitable for the destruction of aerial craft. Then the recent increase in the tax on matches in Germany has given quite a fillip to the production of automatic pocket lighters. A valuable class of life-saving invention, says the report, relates to means attached to miners' lamps for testing for firedamp, whereby each miner is in possession of a gas-tester; while, to refer to another branch, the use of ultra-violet rays in the sterilization of water and other liquids, and in the maturing of wines, is a further example of the manner in which the higher sciences are being applied to meet every-day requirements.

Turning to the particulars of last year's work of the Patent Office itself, it is seen that the number of applications for patents in 1910 (30,388) was larger, with the exception of 1909 (30,603), than that in any other of the past ten years; while the number of complete specifications filed constitutes absolutely a record—at any rate, since 1900, to which date the statistics go back. The figures for the last four years have been: 1907—applications, 28,915; complete specifications filed, 18,829. 1908—28,598 and 17,746. 1909—30,603 and 18,705. 1910—30,388 and 19,105. The number of applications (out of last year's huge total) received from women inventors was 671, compared with 648 in 1909. Of the total number of applications for patents, 19,491 were received from persons resident in England and Wales, 1124 from Scotland, and 306 from Ireland. The applications from most of the British Colonies did not differ greatly in number from those made in 1909; but those from New Zealand exhibit a substantial increase. There is an increase in the number of applications received from the following foreign countries: Austria, Belgium, Brazil, Denmark, France, Germany, Hungary, Italy, Norway, Spain, and the United States; a decrease in those from Egypt, Holland, Russia, and Sweden. The applications from Germany numbered 3221, compared with 3038 in 1909; from the United States, 2818, against 2787; and from France, 1075, against 997. The number of patents sealed in 1908 was 15,949, or 55·7 per cent. of the applications; and out of 14,465 patents sealed upon the applications made in the year 1897, 442, or 3 per cent., were maintained for the full period of fourteen years. The number of patents which expired in 1910 was 15,741; and the total number of new patents sealed, 16,269. Thus the number of patents in force increased during the year by 528.

As to the result of the examination of the complete specifications filed upon applications made in the year 1909, it may be remarked that 1001 of the specifications were reported as wholly anticipated, 10,233 as partly anticipated, and 5187 as not anticipated. Of those anticipated, 9727 were amended without a hearing taking place, and 1005 after a hearing and decision. In 370 cases, a reference to a previous specification was inserted. Under the power given to the Comptroller to revoke a patent upon the application, within two years from the date of the patent, of any person who would have been entitled to oppose its grant, there were six applications. In one of these cases, the patent was revoked; in two an amendment of the specification was required; and in three the application was dismissed. There were five instances in which patentees availed themselves of the provisions of the Act and offered to surrender their patents. In four of these cases the patent was revoked; and the remaining one was not proceeded with. The number of applications made for the revocation of patents worked exclusively or mainly outside the United Kingdom was six; but three of these were subsequently abandoned. In one of the remaining cases the patent was revoked; in one the application was dismissed; and one is pending. Four petitions for the extension of the term of patents were lodged in 1910. Of these, three were abandoned, and the remaining case is still undecided. There are now four patents in force which have been prolonged beyond the usual period of fourteen years.

Last year the receipts from patents fees were £276,904, compared with £267,985 in 1909; from designs fees, £6410, against £5578; and from trade marks fees, £18,292, compared with £17,247. The receipts from sales of publications were £12,418—making the total receipts £314,024, as against £302,839 for the preceding year, or an increase of £11,185. The expenditure, £214,955, also exhibits an increase of £6419.

It is announced that Messrs. Whittaker and Co., Limited, will shortly publish a book, entitled "Modern Illuminants and the Principles of Illuminating Engineering," by Mr. L. Gaster and Mr. J. S. Dow.

BYE-PRODUCT COKING PROGRESS.

At a Meeting of the Yorkshire Section of the Society of Chemical Industry, held at the Department of Applied Science of the University of Sheffield on Monday last week, Professor L. T. O'Shea, of the University, read a paper on "Recent Progress in the Bye-Product Coking Industry."

The lecturer briefly referred to the beehive oven, and said its conversion into a bye-product oven had not stood the test of time. He knew of only one instance in which it survived for this purpose—viz., the Chambers oven, which was still worked by the inventors, Messrs. Newton, Chambers, and Co., at the Thorncliffe Iron-Works and Collieries, near Sheffield. The development of the retort oven had been more successful, though somewhat slow, in this country. As showing the progress made in the coking industry, the lecturer gave the following table:—

Number and Kind of Coking Ovens Used in the United Kingdom.

Year.	Beehive.*	Simon-Carvés.	Semet-Solvay.	Coppée.	Bauer.*	Koppers.	Otto-Hilgenstock.	Simplex.	Huessener.	Collin.*	Mackay-Seymour.	Proctor.*	Other kinds.*
1905 .	24,296	726	470	170	52	136	503	..	120	..	..	..	1422
1906 .	22,354	768	594	170	52	222	768	78	120	..	..	..	1482
1907 .	..	..	722	222	..	332	853	194	150	..	..	..	..
1908 .	18,478	1044	846	237	52	472	958	244	210	45	32	10	837
1909 .	17,393	1143	896	237	52	502	1062	284	244	45	32	..	865
1910 .	..	..	1086	282	..	602	1247	..	250	..	..	..	..

* The figures in these columns are obtained from the reports on Mines and Quarries. The figures in the other columns are given by the firms themselves.

Perhaps the most striking evidence of progress in the industry was afforded by the annual records of the production of sulphate of ammonia. The figures given in the reports of the Chief Inspector under the Alkali Acts showed that in 1896 the total yield of sulphate was 190,909 tons, of which 9078 tons, or 4·8 per cent., was made in producer gas, coke, and carbonizing works; and that in 1900, of the 213,726 tons produced, 10,393 tons, or 4·8 per cent., were produced in coke-ovens alone. For the next nine years, the figures for coke-ovens rose from 12,255 tons to 82,886 tons; the total production in the same period having grown from 217,213 tons to 349,142 tons. The production of sulphate of ammonia in the United Kingdom had increased 50 per cent.; whereas that of coke-works had gone up sixfold. In 1900 it was 4·8 per cent. of the production; in 1908 it was 19·8 per cent.

Figures such as these were evidence of considerable progress and activity. Still, it would appear that we are far behind German coke manufacturers in the extent of the industry. Herr C. Rau, in a paper on recent progress in the Recovery of Bye-Products from Coke-Ovens," submitted at the International Congress of Mining, Metallurgy, Applied Mechanics, and Practical Geology, gave the following figures for the years 1900 and 1909; showing the proportion of coal carbonized that was coked in bye-product ovens in Germany, Great Britain, and the United States:—

	1900. Per Cent.		1509. Per Cent.
Germany	30	..	82
Great Britain	10	..	18
United States	5	..	16

The production of ammonia in coke-ovens was only second in importance to the production of coke. Derived from the nitrogen in the coal, it had long been known that only a small proportion of this element was recovered as ammonia. The average yield of sulphate of ammonia from the coals treated in coke-ovens did not correspond with more than about 15 per cent. of the total nitrogen in the coal. The lecturer briefly described the old processes for the separation of the products of coke-works into tar, ammoniacal liquor, and benzol. There were, he said, various chemical processes for the treatment of the waste liquors; but, owing to their cost, and probably also because the money so spent was unremunerative, they had not been adopted in coke-works—at all events, in those with which he was acquainted. In one of these, recently invented by Radcliffe, the liquor was treated with waste gases from the ammonia still; but he had not heard that any working plant had been erected. The chief sources of objection to the discharge of these liquors were the large amount of lime salts they contained, the phenolic bodies present, and the cyanogen compounds, chiefly sulphocyanides. By a process of oxidation with hydrogen dioxide, Mr. M'D. Mackay had succeeded in purifying the liquors, but, he believed, at a prohibitive cost. Experiments which he (the lecturer) had made, led him to believe that the phenols could be completely removed by oxidation with Weldon Mud; but he had not yet succeeded in removing entirely the sulphocyanides.

The most important advance in bye-product recovery was to be found in the direct process for the recovery of sulphate of ammonia, the successful introduction of which would partially, if not completely, solve the question of effluent. The lecturer gave an account of the processes in which use is made of the sulphur in the unpurified gases for the conversion of the ammonia into sulphate, thereby saving the cost of the sulphuric acid. He said

that such processes as these marked probably the greatest advance in ammonia recovery at the present time. A recent development of the coking industry was the supply of coke-oven gas for illuminating purposes.*

At the close of the lecture,

The Chairman (Mr. E. A. Brotherton) remarked that the recovery of bye-products from coke-ovens had added materially to the wealth and well-being of the community. So far, coal had been carbonized primarily with the idea of producing coke for metallurgical purposes; and ammonia, tar, and the gas had been termed bye-products. This state of affairs might last some little time; but he could conceive coke being produced before very long at the pit mouth for domestic purposes. He could quite suppose that the gas evolved would be converted into power, and the power into electricity, and the electricity distributed to our great cities. In a word, instead of coal being sent into our towns, electrical power might be sent there. As an economic proposition, it had much to attract them; but particularly would it appeal to many when they considered what a vast improvement such a method would effect with regard to the atmosphere in the great centres of population.

Dr. Calvert (of the West Riding Rivers Board) thought that the river authorities, in pressing for the purification of the waste liquor, had been the cause, if not of the invention, at any rate of the adoption of methods which effected a great saving to the manufacturer. Owing to the simplicity of some of these processes, especially the Otto, in which a large portion of the plant was done away with, it would pay coke-oven proprietors to scrap their old plant and put in new. The volatilizing process was a further step, in which an attempt was made to utilize the sulphur already in the gas; and this, he understood, would in most coke-ovens effect a saving of from £1000 to £2000 a year.

CONTINUOUS v. INTERMITTENT CHARGING.

Mr. N. H. Humphrys' Views.

In the course of a communication to the "American Gaslight Journal," Mr. N. H. Humphrys, of Salisbury, deals with vertical retort carbonization, and is reminiscent of his experiences with the Settle-Padfield plant at Exeter.

He writes: It is now eight years since I was professionally engaged in some investigations as to the capabilities of the Settle-Padfield vertical retort as erected at the Exeter Gas-Works. A full-sized specimen had been provided, with special condensers, purifiers, meter, and gasholder, and arrangements for collecting liquid products. Some of the results were published in the "Journal of Gas Lighting" at the time, and attracted much interest and also some criticism. So far as I know, they were the first results published that illustrated the advantages of the continuous system of carbonization, as compared with the ordinary or intermittent system. As a general proposition, it is evident that any chemical process working destructive distillation can be better and more regularly conducted, and under more thorough control, by the continuous method. The manufacture of sulphate of ammonia from gas liquor, and the firing of furnaces for raising steam, may be instanced as examples. So it is not to be wondered that some of the early pioneers in gas manufacture were workers in this direction. Clegg's web retort, Porter's screw, and various other mechanical devices were introduced—all aiming at the continuous feed and discharge. The difficulties of getting any mechanical arrangement that would stand the heat, or the alternate heating and cooling to which it must of necessity be subjected, proved to be insurmountable; and for half a century or more the horizontal retort and manual charging and discharging constituted the sole practical method of manufacture. It is not so very long ago that mechanical experts were wont to enlarge on the lack of development, especially in large works, which they criticized, with some degree of justice, as being nothing more than a multiplication of the small ones.

The chief advantages shown by the Exeter experiments were an increased yield of gas, to the extent of 25 or 30 per cent., as compared with ordinary methods, which was not secured (as is the case with intermittent distillation at high heats or other means of attaining a large yield) at the expense of the quality, or by dilution of the product with air or furnace gases. There was also a greatly improved yield of coke, both as regards quality and quantity. The gas and coke were improved at the expense of the tar, the yield of which was much reduced—indeed, it was found to be quite possible to produce practically no tar. That fluid may be regarded as an accidental product of the intermittent system, although it is generally looked upon as an unavoidable item. It has been claimed as an advantage incidental to certain new processes that are stated on high authority to be superior to the usual methods of making gas, that there is a large yield of valuable liquid products. Now tar is, constitutionally, a valuable product; but for various reasons (which need not be repeated here) gas companies do not get a living profit out of it, and the commercial value of the product from a ton of coal can be figured in pence. A very small increase either in gas or coke is sufficient to compensate for the disappearance of all the tar.

One way of partially reducing the evils inseparable from the intermittent system is to minimize them by the use of heavy charges involving a longer period of carbonization than the time-honoured six hours. Considerable improvement on the ordinary results, on the lines thus indicated, can be secured by these means; but at best they must fall short of completeness.

The whole question of carbonization, apart from consideration of the system adopted, has of late been greatly improved in detail by the introduction of mechanical conveying and stoking devices. Even in comparatively small works, we may find that the coal is not in contact with manual labour from the time it leaves the lighter or railway truck till it finds its last home in the retort; and the same applies to the coke, which is drawn, cooled, sorted, and loaded into the receptacles that are to carry it to its destination, without being touched by hand. Among other details, the continuous automatic feed and discharge of vertical retorts have been brought to a high degree of perfection, with the result that the advantages peculiar to the upright retort are becoming generally appreciated. The Woodall-Duckham system is being introduced on a large scale in London, Bournemouth, and many other places. The Glover-West is in use at St. Helens, Manchester, &c. Extensive installations are in hand at Edinburgh and Glasgow; and the vertical system is largely adopted on the Continent.

Very great expectations existed at one time with regard to the future of the inclined retort, which was looked upon as the coming system, and which promised very considerable economy in the matter of labour. But so much has not been heard of late in respect to extensions of this system.

But whatever the system that may eventually take the front place, it is evident that old-fashioned notions on the subject of carbonization must be reconsidered. It was generally supposed (and the impression is by no means extinct to-day) that there is an economic limit in respect to the yield of gas from coal; and that if the yield was forced beyond that limit, the quality of the product must suffer. As much may be true in regard to any one particular system. It is as true to-day as it was twenty-five years ago, that with the grate furnace and manual labour as practised in 1885, the yield of gas cannot by any possibility greatly exceed 10,000 cubic feet per ton. But after admitting as much, it is still open to look for substantial improvements in other directions. The mechanical stoker and regenerator furnace have enabled makes approaching 12,000 cubic feet per ton to be secured from the horizontal retort. The vertical retort and continuous charging beat this figure by another 1000 cubic feet or more. And while, in the limited sense just referred to, a high or forced yield may mean some sacrifice of quality, the same does not apply to the new processes. So we must confess to-day that there is no narrow limit to the possible yield per ton.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Visit to the Neasden Electricity Generating Station.

On Saturday afternoon, members of the London and Southern District Junior Gas Association visited the Neasden electricity generating station of the Metropolitan Railway Company; being met on arrival by Mr. Dobson, the Assistant Works Engineer.

The party first of all proceeded to the train shed, and inspected an electric locomotive and portions of others under repair, besides various rolling stock. They then made their way to the power station, where the members saw the switch galleries; various portions of the switch gear being put in operation to illustrate the remote control. They then inspected the pumps—oil, water, and feed—and also the huge atmospheric condensers. From here the visitors were conducted to the generator-room, where there are at present two 5000 K.V.A. sets and two 3500 K.V.A. sets; while preparations are being made to erect another 5000 K.V.A. set. The sets are Westinghouse alternators. They generate current at 11,000 volts, which is transformed at the sub-stations to 360 volts (alternating), and is then converted by rotary converters to 600 volts, at which pressure it is supplied to the rails. There are three sets of converting machinery at Neasden, and also the exciting dynamos for the sets. The party inspected the boiler-house, containing twenty Babcock and Wilcox water-tube boilers and automatic stokers.

Here the visit concluded; and on leaving the works, Mr. L. F. Tooth (the President) proposed a hearty vote of thanks to Mr. Dobson and his colleagues for their energy in showing the party round, and remarked that every gas engineer should know as much as possible about electricity. Mr. J. G. Clark seconded the vote, which was carried by acclamation. Mr. Dobson, in reply, said that he was more than pleased to give up his time to show the party over the station, if by this means he had been successful in imparting to them something which would be of use to them in their calling.

We learn that arrangements are in progress by which Messrs. Duckham and Cloudsley, Limited, Messrs. Newton, Chambers, and Co., Limited, Messrs. Gibbons Bros., Limited, and Messrs. Thomas Vale and Sons, Limited, will be associated in a new Company to be formed for the construction of vertical retorts on the Woodall-Duckham continuous system. The title used will be the "Woodall-Duckham Vertical Retort Construction Company."

* The supply of this gas to Little Hulton from the Brackley Coke-Works of the Earl of Ellesmere was noticed in the "Journal" last week (p. 16).

INFORMAL MEETING OF SCOTTISH GAS MANAGERS.

Annual Meeting in Glasgow.

The Twenty-Eighth Annual "Informal Meeting" of Scottish Gas Managers was held in the Windsor Hotel, St. Vincent Street, Glasgow, last Wednesday. Mr. J. B. Scott, of Cowdenbeath, presided over a gathering of more than a hundred.

The Convener (Mr. W. B. M'Lusky, of Perth) intimated that apologies for absence had been received from Mr. W. Doig Gibb and Mr. W. R. Herring, of London, Mr. Alex. Wilson, of Glasgow (President of the Institution of Gas Engineers), and others. He expressed his gratification at seeing such an increasing interest being taken in the meeting, as indicated by the replies he received. There used to be only about five-and-twenty replies to the circular he sent out; but now he had more than a hundred.

PRESIDENT'S ADDRESS.

The President, also expressed his pleasure at seeing so large a gathering, and then proceeded to deliver the following address:—

Gentlemen,—This year promises to be a very interesting one in the history of the gas industry in Glasgow. To-day we meet in our own homely way; and two months hence we hope to have within the city walls, in meeting assembled, the Institution of Gas Engineers; while later, in the month of September, the North British Association of Gas Managers will hold their annual meeting in Glasgow also. There is added interest to this meeting; this year being the Jubilee of the Association. Altogether, I think there is a good time before us; and it behoves us to make the best of it.

HOW NOT TO DO IT.

The changed conditions of the present-day gas supply compared with that of twenty or twenty-five years ago is simply marvellous. In those days little notice was taken of the gas after passing from the works, except perhaps to see that leakage was looked after, and the meters read. The manager lived in the works, and often enough slept in them too; his home being generally within the boundary walls. The local plumbers were the distributing staff; laying the services to consumers' houses, fixing the meters (which in many cases were supplied by the consumers themselves), supplying gas-fittings of every and any kind, and so on. It may interest you to know how things were managed in those days at Cowdenbeath; and perhaps that town has had as varied and costly an experience in gas supply as any I know of. The Company was formed twenty years ago (in the year 1891), to acquire a small oil-gas works which was at that time being carried on by a private gentleman. The price of the oil-gas was fixed at 12s. 6d. per 1000 cubic feet; and the first year the sales amounted to something like £40. There was a deficit, of course; but "hope springs eternal." The business increased; but, alas, so did the deficit. After struggling away for two or three years, wasting oil and smoking everybody out of shops and houses, it was decided to have acetylene. Generators were purchased; and the new illuminant was distributed through the same pipes as the oil-gas had been, at the price of 8s. per 100 cubic feet, or £4 per 1000 feet. Absolute failure, of course, was the result; and to make things worse, the works took fire and were partially burned down. Another attempt was made, this time with a mixture of the two gases; but a second fire ended disastrously. All this happened right in the centre of one of Scotland's greatest coalfields. For two years or so nothing further was done; and the town was without a gas supply altogether. It was in this condition I found it when appointed Manager to the Company in 1901. Many were the woeful tales told to me when I first tried to make the acquaintance of the consumers; and it was very difficult to persuade some of them to try again. In the year of my appointment, the Company had been remodelled, and came under entirely new management. New coal-gas works were erected; new mains were laid; and the present concern is the result.

HOW IT MAY BE DONE.

It is admitted on every side now that the distributing and selling of gas is quite as important as, if not more so than, the making of it, and more especially in recent years, since the use of cooking, heating, and the newer forms of lighting apparatus were introduced. In many towns flat-flame burners are unknown, except for sculleries, stair-lights, &c. Few houses are without cooking apparatus of some kind; and where gas-fires are hired or given free, a great amount of heating is also done by gas. It is necessary then that we should have thoroughly qualified men to look after the wants of our consumers—men who know how to fix and regulate an incandescent burner, who can advise consumers as to the class of cooker or fire that will suit them, and the many other wants that are always before us. It was with an idea of making our outside staff as conversant with their work as possible that I held a series of lectures in the workshop a year ago, taking up such simple subjects as: Pipe laying and gas-fitting, candle power or illuminosity of coal gas, calorific power or heat value, hints about the bunsen flame, pressures and vacuums, &c.—giving illustrations on each subject with what apparatus I had at command.

The men were delighted to come back in the evenings and listen to my explanations, and it set them to think of their work, and take a greater interest in it. It is never lost time spending an hour with workmen giving them one's own experiences, and it often enough makes one's own labours a great deal easier. We have perhaps gone as far as most small gas companies in the way of offering facilities to our consumers. We have never charged for laying service pipes; we fix meters free of hire; cooking appliances of every description are fitted absolutely free of cost and hire, incandescent burners, outside lamps, &c., are overhauled and cleaned free (except mantles, which are charged for), and paltry escapes or faulty fittings are made good all at the Company's expense. Shop lighting always gets our best attention; and our show-room, as far as possible, contains the latest appliances for cooking, heating, and lighting. We spend on this free maintenance work from 1½d. to 2d. per 1000 cubic feet of gas sold. Is it worth it?

We always manage to keep on friendly terms with the local plumbers, although we offer against them for gas-fitting work; and being able to keep a large stock of incandescent goods, glassware, &c., they generally get their requirements from us, and these we supply at a cheap rate. I bear in mind, of course, that a company is in a very different position from a corporation.

PRESSURES.

With the introduction of low-quality gas, and the many varied uses it is put to, the pressure on the mains must be very carefully attended to; and anything less than 2 inches pressure is sure to lead to complaints and dissatisfaction. I prefer to have the pressure as near 3 inches as possible. In these days of incandescent burners, 15 or 16 candle gas under a good pressure is, in my opinion, worth more to the consumer than 20-candle gas under a poor or unsatisfactory pressure.

HIGH PRESSURE.

High-pressure distribution has been receiving a good deal of attention in later years, and many installations have been fitted up. In West Fife alone, within a radius of twelve miles or so, we have five installations at work; and I venture to say that very soon compressors will be quite as common in gas-works as exhausters are at the present time. And why not? What can be more simple, when one finds himself in a tight corner to keep up the supply, than to lay down a high-pressure main with a compressor forcing the gas out to any district that may be in want of it. The cost of this system, against that of laying a low-pressure main to do the same work, is considerably less, and is much more effective. Again, outlying districts can be tapped with a small high-pressure main that possibly could never have been made to pay with a low-pressure main. The ideal in distribution will not be reached until we have both a high and a low pressure system—the former feeding the latter at points all over the district, so that a uniform pressure will be kept up night and day over the whole area. Given these conditions with a regular quality low-grade gas, then the complaints of "bad gas" would be exterminated. Some time ago we took into our area an outlying district, but found that we could not give a satisfactory supply through our low-pressure mains. There were no second thoughts as to what we would do. A compressing plant was installed, and a high-pressure main was laid, and all the trouble was immediately overcome. This addition not only got over the difficulty, but it added considerably to our working storage capacity.

Out of a storage capacity of 150,000 cubic feet, 100,000 cubic feet, or two-thirds of it, was under a pressure of only 30-10ths, which was absolutely no use to us during the heavy lighting hours, as we required a pressure of 45-10ths at the outlet of the station governor. We were, therefore, at the mercy of 50,000 cubic feet storage to run from (say) four o'clock in the afternoon till midnight, during which time we had an output of about 80,000 cubic feet. Then we could again fall back on the 30-10ths holder. In testing the pressures regularly throughout the winter months, this is something like what I found:

Pressure at outlet of station governor				45-10ths.
,,	at point	600 yards out		30 ,,
,,	,,	1000	,,	22 ,,
,,	,,	2500	,,	19 ,,
,,	,,	5000	,,	12 ,,

Now, with the aid of the compressing plant, the pressures are:

At outlet of station governor				38-10ths.
600 yards out				32 ,,
1100	,,			28 ,,
2500	,,			33 ,,
5000	,,			25 ,,

The point 2500 yards out is where we admit the supply from the high-pressure main. By carrying this main further, and making more connections to the low-pressure main, we can have a uniform pressure from end to end. The trouble in our case, of course, was having too small pipes, not through any mistake, but when you consider that pipes laid for a 12 or 15 million works are asked to do the work for 35 millions, you cannot wonder that we should find ourselves in a difficult position. But while the pressures were so much levelled-up and increased, so also was our storage capacity, because we draw the gas from the small holder so as to

supply the compressor, thereby saving the gas in the larger holder to supply the 38-10ths at the station governors. Therefore the more gas we put out with the compressor, the larger is our working storage capacity. This is a very important point in smaller works where the holder pressure is not equal to the demand.

The plant we adopted was supplied and erected by the Bryan-Donkin Company, and is of their usual type. The steam supply is governed by a diaphragm regulator worked by the pressure of gas taken from the outlet of the compressor. The main is of Mannesmann steel tube, jointed in the ordinary way with molten lead joints; and governors (also by the Bryan Donkin Company) regulate the supply to the low-pressure main at the extreme end. The main is divided into sections, by valves, for testing purposes. The laying and jointing of the pipe is an important point; and the primary thing in getting a good high-pressure main is to buy a good quality and gauge of pipe. It is badly saved money, in my opinion, to lay the cheaper and lighter gauge of pipe. We tested the high-pressure main daily when laying, by compressing air into the pipes to a pressure of 20 lbs. per square inch; and so satisfactorily was the jointing done that not more than a dozen joints showed the least sign of leakage. I might mention that the blowing-off of the compressed air had the effect of clearing all dust from the main. We only meantime raise this pressure to about 1 lb. at the compressor; but I am prepared to make it 10 lbs. or more when necessary. We are now also in the position to offer high-pressure lighting; and; in fact, we have already offered to the Town Council to light their main streets with 1500-candle power lamps.

PRIVATE HIGH-PRESSURE LIGHTING.

I have no idea to what extent high-pressure supply for private lighting may go. One thing is wanted there—viz., the meter. I believe there are meters in the Patent Office at the present time, and I hope to see them on the market soon. Private high-pressure supply would be all right provided we were cutting out an opponent; but to cut out our own low-pressure supply with a high-pressure one seems to me to be duplicating our capital outlay. Better, however, to have two strings to our bow than lose customers; and perhaps we are only doing our duty to put before them the best of our wares, so long as they are prepared to pay for them.

COMPETITION.

In almost every town of any importance we have to face the competition of the electric light; and in the smaller towns with high-priced gas, the competition is pretty acute. In some cases, of course, people will have the newer form at any price; but the astute business man generally wants to compare two and two before he makes a change. Therefore, we are often faced with the question, "How does your gas compare in price with the electric light?" In some cases it is difficult to answer; not that we cannot give sufficient data to prove our claim, but often enough because we cannot get our customer to realize that it is not 1000 cubic feet of gas he is buying, but a certain amount of light, and to get him, in fairness to both parties, to take into consideration the amount of light he is getting for his money. The maintenance, too, is often left out of count; but it is a very important matter, and may often enough decide the case. It did with one of our customers who had installed the electric light. His maintenance was so high that at the end of a two-months' trial he had his gas-fittings re-installed, and is back to the fold again. An incident like this in a small town has a wonderful effect—more perhaps than a whole page of data. But perhaps our best method is to keep on "hawking" our wares from door to door; snatching an order here and there like the ordinary tradesman. Our competitors do it, and do it artfully; and we must if we want to retain our position. Is the gas manager of to-day fighting a dying game, as some of our opponents would like to make out?

WELDED JOINTS.

A good deal has been said lately of welded joints; but I am not prepared to say much about them at this early stage. What I have thought of for colliery districts, such as ours, where we are much troubled by subsidences, is to have an extra deep faucet, so that the joint would draw a long way before any serious loss could take place. A stiff, rigid, welded joint without provision for expansion would, I am afraid, end disastrously in a district such as ours. It is not uncommon for us, in some parts of our district, to get the spigot end of a pipe drawn almost clear of the faucet. In fact, a year ago we had a very dangerous subsidence, which carried about 8 feet of our main pipe right down into the colliery workings, leaving the open end blowing full bore until some one, at the risk of his life, managed to plug it up. Only the other day in one of our main streets, a car rail, the section of which you are all acquainted with, snapped like a bit of cord, and the two ends immediately separated about 3 inches. After such experiences as I have had, I am inclined to recommend steel mains for both high and low pressure distribution; but provision must be made for expansion.

AUTOMATIC STREET LIGHTING.

As I was one of the first in Scotland to adopt automatic street lighting with the pressure-wave apparatus, I can hardly pass without saying a word about it. We are now in our fifth year of working this apparatus; and I think we have experienced it in all its moods. The town itself is lighted with electric light by the Town Council; but immediately outside the burgh we have an installation of about 40 lamps, and these are now working most satisfactorily. In another district, we have entered into a contract with the County Council to light the streets for a period of fifteen years. In this case we had no option, as the pressure-wave apparatus was specified; it being selected after very careful consideration. We have also been able to secure a good deal of back-court lighting with the automatic apparatus, as it entirely frees the proprietors of all trouble and responsibility of lighting and extinguishing. Our system is to light up at dusk, and extinguish at 11 o'clock; lighting up again from 5 to 6 in the mornings while the miners are turning out to work. The morning lighting is a great convenience to the workers; and while it is a simple matter for us to light up the lamps for an hour at that time, it would be very costly to do so if the lighting was done by hand. Our attendant is provided with report forms, which he fills up daily, showing whether any apparatus may have failed to operate, the number of bye-passes out, mantles used, and other information in connection with the work. For the past five months the total number of actuations of this apparatus have been 24,000, and the failures 67, or equal to 0·28 per cent. on the total number of actuations. Only 38 bye-passes have been out; and the average number of mantles used per lamp is four. The cost of attending to these lamps is included in the 1½d. per 1000 cubic feet I mentioned earlier. Other three districts in our neighbourhood have adopted this system; and in each case they have been thoroughly satisfactory.

I might be allowed to draw your attention to a report in the "JOURNAL OF GAS LIGHTING" for Jan. 10 last of a very exhaustive test which was carried out by the Lighting Committee of Newcastle-on-Tyne. I think the result of the test proves that automatic lighting is well worthy of our consideration, and also that it is quite adaptable in large cities—that altitudes and varying pressures can be overcome, and that a great saving can be effected.

CARBONIZING.

The late Mr. William Young, whose memory will go down through the ages as one in the forefront of carbonizing, used to say "put yourself in the retort, man, and see what happens." If we could only do it in the way he did, we would be wiser men.

Three years ago, when Mr. George R. Hislop was President of this meeting, he spoke of vertical retorts as against the American coke-oven system and Love's forty-fives. Two years ago, Mr. Vass also spoke of the new carbonizing methods; while last year we had a contribution from Mr. Herring on the same subject. This year, however, finds us in the midst of practical working of verticals; and although the subject is certainly a very interesting one, I have to refrain from saying very much about it. My reason is not far to seek. There are those among us who have tackled verticals in a very practical way; and in the near future I have no doubt we will get some very interesting information, so I do not wish to forestall those of the practical experience with any meagre second-hand information that I can give. There can be no doubt, however, that vertical retorts have come to stay, and to play a very important part in the gas production of the future; and whether the favoured type is to be intermittent, continuous, or any other, time will tell. There is one important feature about them, and that is the possibility of the smaller-sized works being able to have an installation when they could never have hoped to work to advantage a mechanical stoking plant. But, after all, those who can afford to wait are possibly in the best position, especially in smaller works, where we cannot afford to carry out experiments. We can, however, make the best of what we have got; and it is very good that cannot be improved.

In looking over the "Gas-World Year-Book Statistics," I find that in England 87 per cent. of the gas undertakings are supplying gas of less than 18-candle power, while in Scotland only 4·18 per cent. are doing so. Only 11 gas-works in Scotland are supplying gas under 18 candles. I have tried to find an explanation of why this should be; but it is a difficult problem to solve. Is it our carbonizing methods, or is it the high quality coal we are able to procure in Scotland? Do the gas consumers demand this high quality; or is it use and wont? Possibly it is part of all these things; but it would be interesting to know what would be the ultimate gain to Scotland were the candle power reduced to that ruling across the Border. In Cowdenbeath, we have never professed to supply anything beyond 16-candle power, and we make no attempt to enrich. What we have done is to educate the consumers to the use of incandescent burners; and we have succeeded.

Some two years ago, hoping to improve our carbonizing results, we introduced Meunier's patent hydraulic-main floats; and the results have been very satisfactory. The make per ton has increased by 600 cubic feet, and carbon is almost unknown. By the introduction of these floats, the oscillation of the main is practically reduced to *nil;* and the seal of the dip-pipes can be reduced to a minimum, thereby reducing the back-pressure on the retorts, and getting the full advantage of the exhauster, and that with absolute safety.

A reference to the accompanying diagrams will explain more readily the advantages that may be expected from these floats than any words of mine. Both charts were taken from the ascension pipe of the same retort—a centre one of an oven of eight, which works into a short main about 9 feet long and quite separate from the other mains. So that, naturally, the oscillation would be greater than if the main had been a long one. We work the exhauster at level gauge, and we have no retort-house governor.

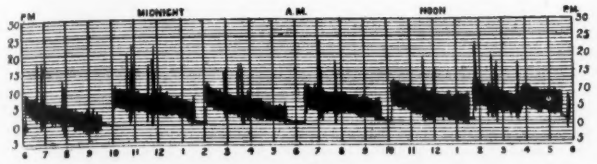


Diagram No. 1—Taken from the Ascension Pipe with Meunier's Patent "Floats" in Position.

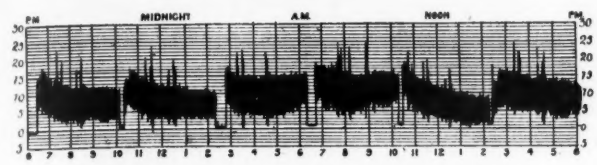


Diagram No. 2—Taken from the Same Place without Meunier's "Floats."

No. 1 diagram is with Meunier's floats in position, and No. 2 without the floats. You will notice that the oscillation is quite 50 per cent. less with the floats in position; and I am quite convinced that there is a great advantage to be gained by their adoption. It is also claimed that these floats are a very effective cure for naphthalene. Owing to the action of the main being so very steady, the heavy tars fall immediately to the tar outlet, leaving the lighter tars in a partly gaseous condition; and these, having a tendency to intercept the naphthalene, are carried forward, and ultimately both are deposited in the condensers and the syphon-pots. This, of course, depends so far on the composition of the coal. A coal yielding a larger quantity of the lighter tars which have an affinity for naphthalene would, of course, absorb more napthalene than another coal where the heavy tars are predominant.

In all colliery districts, we generally cannot do better than use the most suitable coal that the district may produce; and it is on these lines we work in Cowdenbeath. The results are very satisfactory. They are as follows: Gas made per ton, 10,200 cubic feet; coke saleable, 8 cwt.; tar, 10 gallons; sulphate of ammonia, 20 lbs. The 10,200 cubic feet is not a large make, as makes are going; and I have not the least doubt that were I to use a better gas-producing coal, and further reduce the seal on the dip-pipes (which I could easily do), 11,000 cubic feet might be reached. But the question is, Would it pay? If you make more gas per ton, you are using less coal; therefore, less residuals are produced, and the saving in fuel is *nil*, and must be very little on wages. Large makes are not the rule in the towns where gas is being supplied cheapest—in Scotland, at any rate. The whole question resolves itself into a commercial one, whether it pays better to produce gas or residuals; and that depends entirely on the price obtained for them.

PURIFICATION.

The cost of purifying has now come to be a very small item in the working expenses of a gas-works, being often enough less than ½d. per 1000 cubic feet; and in this branch small works can compete very favourably with large ones. No doubt oxide purification, which has reduced the labour to a minimum, has helped greatly to lower the cost. The number and size of the boxes—in other words, the purifying area and time-contact—have also a great deal to do with successful purification of gas; and being face to face with a remodelling of our purifying plant, I have been trying to decide what is a reasonable purifying area and in what size and number of units should it be divided. There are many things to take into consideration when making inquiries into a subject like this. Local conditions, for instance, may completely upset comparative figures altogether; and the composition of the coal used may have a decided effect on the working of purifiers. So also may the individual carbonizing methods of each gas-works. The cubical content is also important, and must be taken into account as well as the superficial area. We cannot get away from the maximum daily make as the figure to commence with; and by doing so we are placing all gas-works as nearly as possible on the same level. Mr. Newbigging's figure is 0·6 superficial foot per 1000 cubic feet of gas made at the maximum daily make for four purifiers, three on and one off. That is, 0·6 superficial foot for each box; or 0·6 × 4, giving a total area of 2·4 superficial feet per 1000 cubic feet of gas made. This figure is no doubt workable; but you may be a little surprised when I tell you that out of 63 gas-works in Scotland with which I have been in communication, only 8 are near it. Not content with a few inquiries made here and there, I decided to take the existing conditions of a large number of representative Scottish gas-works as evidence. The replies I had from 63 works represented two-thirds of the gas made in Scotland, keeping out Glasgow and Edinburgh. I took first the average of the whole; second, the twelve highest; and third, the twelve lowest. They are as follows:—

	For 63 Works.	For 12 Highest.	For 12 Lowest.
(1) Average superficial area per 1000 at maximum daily make	4·35	7·22	2·36
(2) Average cubic area per 1000 at maximum daily make .	21·2	35·4	11·4
(3) Average cubic area per ton of coal carbonized per annum	1·0	1·65	0·51

You will notice that the average superficial feet per 1000 is 4·35, against Mr. Newbigging's 2·4. You will also notice that for every superficial foot there is an average of 5 cubic feet; and this works out roughly about 1 cubic foot per ton of coal carbonized, taking the make at 10,000 cubic feet per ton.

The twelve managers represented in the second column must be very happy. But I can sympathize with the other twelve, as I find myself in the same position as they are. The figures of our purifiers are 2·70 superficial area; 9·4 cubic area; 0·43 cubic area per ton. I have summed up the evidence of these inquiries, and have come to the conclusion (basing my figures on these existing conditions) that a fair average purifying area would be a combination of 4 superficial feet per 1000 at maximum daily make. In a rough way this would be one cubic foot per ton of coal carbonized per annum; and this area should be divided into not less than four boxes. Of course, there is no reason why you should not have more than the above area; and it is always advisable to have a reserve for future growth of business, and one or two catch-boxes in addition. The average depth of all the boxes works out at 4·8 feet. The number of layers of material is two; and the average depth of material is 2·5 feet. This latter varies greatly—some evidently getting splendid results with three layers of 8 inches each; while another is getting equally good results with one layer of 24 inches or more. Out of 63 works, 17 use lime only; 10, lime and oxide; the remainder, oxide only. Superficial area is not everything in purifiers; and, in my opinion, to give a satisfactory time-contact, the cubical capacity should not be less than five times that of the superficial area. The trouble in small works having deep purifiers is the charging and discharging, as the deeper the box the more labour and expense are caused; and, of course, mechanical apparatus is too costly.

I trust the results of my inquiries may be of interest to you regarding the sizes of purifiers. I think they show great wisdom in present-day gas management. But perhaps the more important question is, Has oxide, working alone, proved itself to be a thoroughly satisfactory purifying agent?

RESIDUALS.

The recovery of ammonia is an interesting and profitable business to all gas concerns, but especially to works situated at a great distance from chemical works. Here again the composition of the various classes of coal plays an important part, as some are much richer in nitrogen than others. The average yield of sulphate of ammonia in Fife coal is very low; being 17 to 22 lbs. In our own case, we average about 20 lbs.; while in the West of Scotland coals, 28 to 35 lbs. is the common run. All classes of residuals are valuable, and especially so to small works; and the value has been greatly enhanced in later years by the good work of such bodies as the Sulphate of Ammonia Committee and the many Commercial Sections formed. It is well worth while for every gas manager to associate himself with these bodies.

PUBLICITY COMMITTEE.

In closing, I would just like to say a word in connection with the publicity scheme which we have all heard about. There is no question about the good services that have been rendered to the gas industry through the inauguration of the many Commercial Sections; and I think to have a united effort in bringing the many uses of coal gas before the public, would be a very good thing indeed. It is for this purpose that the Publicity Committee has been formed; the principal part of the work being fully explained in paragraphs 5, 6, and 7 of the circular which was issued to all conveners and chairmen of gas undertakings. These paragraphs read as follows:—

> (5) The advertising and publicity work which the Committee propose to undertake would be of a general character and aim, comprising mainly advertisements and articles in publications which circulate throughout the kingdom. Subscribers would, however, have the very great advantage of being able to obtain for local purposes expert assistance, advice, and information. The Committee would also assist undertakings in organizing local exhibitions, lectures, &c.
>
> (6) A representative Executive Committee, with expert assistance, would direct the operations of the organization and control the application of the funds.
>
> (7) A necessary preliminary to any further action is the financial support of the whole British gas industry; and the Committee therefore now appeal to all the gas undertakings of the United Kingdom for such support.

Although the circulars were issued to the conveners and chairmen of undertakings, I expect that in almost every case it will rest with the manager, as their adviser, whether they will support it or not; and I think it is our duty to favourably consider the scheme. For instance, witness the following paragraph which appears in a "Manual of Housewifery." "Gas should never be burned in a bedroom during the night, as the gas given off is as deadly as the carbonic acid gas given off by the lungs." Surely something is required to be done to check such statements as these from appearing in either one kind of book or another, or at least to contradict them.

The question of finance, of course, is an important one; and here perhaps things are not turning out so well as might be. Unless the scheme is supported nobly by both corporations and companies alike, it can never hope to be a thorough success. In some cases it has met with rebuffs; but I hope these cases will be further considered when the scheme is better known, and also that

all legal questions as to subscribing will be successfully got over, in favour of this great forward movement which is to benefit the nation as a whole, and particularly the great industry which we all toil for.

Discussion.

Mr. W. B. M'Lusky (Perth) said Mr. Scott was in the very fortunate position of being in a growing place, where the make of gas was going up, just as it would do in altogether new country. He had shown that he was alive to the necessities of the modern gas consumer, because he had done everything once and for all, and had evidently not had to turn back. He (Mr. M'Lusky) had been highly struck with the arrangement for the maintenance of consumers' fittings. Mr. Scott was spending from 1½d. to 2d. per 1000 cubic feet upon this, which, he was satisfied, was saving the consumer from 20 to 40 per cent. on his gas bill. With the variety of incandescent gas-burners in use, it was somewhat inevitable that a waste of gas should go on, almost without the consumer's knowledge. When the light was dim, the consumer blamed the gas; and it was therefore advisable that incandescent burners should have the attention of a man of skill. In 1905, the Town Council of Perth made an arrangement, which he put before the North British Association at their meeting at Stirling, and which he might say solved the problem of maintenance. They kept a stock of approved sorts of burners and mantles, and he understood that there was not 5 per cent. of the burners and mantles used in Perth that were not supplied from the Council's show-rooms. The business had increased from a matter of £500 to about £700 a year; and the stock, now that the value of these goods was less than it used to be, could be held for £300, whereas at the beginning it cost £500. The plumbers and gas-fitters really acted as their agents. They canvassed their customers for gas, and in this way brought it well before the public. It was getting more and more necessary to have uniform pressure, not only in the mains but also at the point of ignition. They had introduced a system which was recognized in England as being suitable for the purpose—viz., letting governors to consumers on hire. Any consumer who was willing to pay from 1s. 9d. to 4s. per annum could have a governor fitted. They put it on to the service-pipe before the meter, and quite close to it. Automatic street lighting without maintenance was a failure. In his experience, there were more dirty lamps and neglected burners where automatic lighting was introduced than where the lamplighter was going round. Where a town council or a gas company took up the matter of automatic street lighting with a single eye to saving money, they would lose more on the one hand than they gained on the other. Only eleven gas-works in Scotland supplied gas of less than 18-candle power. If there were another column in their "Statistical Report," requiring them to state how the candle power was ascertained, it would probably be left blank. He thought the President did very well in getting more than 10,000 cubic feet of gas per ton from the small coal he used. His (Mr. M'Lusky's) experience was that with horizontal retorts, partly filled, it was very difficult to maintain the value of the gas while extracting the higher yield per ton. They had to stop somewhere, because the gas suffered in the space between the top of the coal and the roof of the retort. He got some 11,000 cubic feet of gas per ton from coal costing about 7s. per ton at the pit. The figures given with regard to purification were not Mr. Scott's, but those of Mr. Hislop, of Paisley, who many years ago fixed a foot per vessel, and a minimum of three vessels, which would give a working area of 3 superficial feet per 1000 cubic feet of gas made per day. Mr. Newbigging was also entitled to say that 0·6 was correct, because his experience had been with different coal from that used by Mr. Hislop. There were gentlemen present who knew that 0·6 was a very liberal allowance for certain classes of coal. The depth of the purifying material was also a matter which varied. If they used "Lux," or bog ore of equal value, they did not require very much depth; but if they were using material that contained a very small quantity of active purifying medium and a very large percentage of other material, they would require to put a greater quantity into the boxes. Then, also, if other parts of the plant were not doing their work, the purifying material might clog, and the foul gas not reach it. Every member of the Perth Town Council had had recently sent to him a copy of the London "Standard," in which a writer had pointed out the "poisonous" qualities of coal gas. This was a subject with which the Publicity Committee of the Institution of Gas Engineers would have to deal. He concluded by proposing a vote of thanks to the President for his address.

The vote was accorded and briefly acknowledged by the President.

Mr. A. Yuill (Dundee) thought most of those present would agree that the meeting they were having, and more especially the address which had been given to them by the President, showed that they were in a position, and were able, to deal with matters they did not meet with in any of the papers brought before the North British Association. The President began in a reminiscent vein, giving the early experience of the place he was associated with; and he then led them on to what he found, from his experience, was best suited for the development of the Company he served. He (Mr. Yuill) had always found it to be the case that if they dealt generously with the community they served, the company or corporation would reap the reward. He thought the position in which the President had placed himself, in trying to benefit the consumers by giving them wise counsel and advice, and also in educating his staff in the various things connected with the department, was well worthy of emulation by every gas manager. In giving or fitting appliances, and doing work which belonged, in the view of some, to the trade, they must remember that with a company they had a free hand, but that with a corporation difficulties were sometimes created which rendered it troublesome for those under them to take up the line they would naturally follow. But with a little consideration for the trade, and while still having some for their consumers, there was a happy medium which would benefit all. Most of them had arrived at the conclusion that they must try to aim at uniformity in pressures. In dealing with illuminating power, they had reached the point of greater uniformity than they experienced when the illuminating power was given in their "Statistical Report" at from 25 to 30 candles. They knew the difficulties they had in dealing with high-quality gas in cold weather. Low-quality gas did not suffer in the same way; and therefore it was better to have a low quality. Some of their friends could not understand why in Scotland the illuminating power of the gas was so much higher than in England; but he thought those who had had experience with coking coal knew that it yielded a higher average than they obtained from English coal. With incandescent gas-lighting so universal, he considered it was a necessity that all consumers should have a governor fixed to their fittings, because they had an adjustment for both the pressure of the gas and the admission of air; and whereas the latter remained fixed, the former varied. If they altered the pressure of the gas, they disturbed the equilibrium. With a governor on the fittings, they would be able to get a better mixture of gas and air. He believed the day had gone for laying down large mains—of 24 inches and upwards—because with a small pipe they were able to distribute a volume of gas to outlying districts, which they could not do before. In Dundee they had introduced a high-pressure system of distribution, and one of his assistants read a paper upon it to the Junior Gas Association.* After a winter's work, they had had no reason to complain of any difficulties arising in the supply of gas at high pressure. With reference to the laying of high-pressure mains, he certainly would advise that they should be of steel. He did not wish to advertise the Mannesmann tubes more than those of any other maker, but he would say that they were some of the best that could be used. He also found that a joint made with lead wool was better than one made with molten lead. They had had a very good illustration at Dundee as to the capabilities of different-sized purifiers. In their carburetted water-gas plant, they used a set of four purifiers (25 feet and 30 feet), three on and one off. Taking Mr. Newbigging's rule of 0·6, these purifiers were capable of passing 41,000 to 42,000 cubic feet of gas per hour; and they found that when they slightly exceeded 40,000 cubic feet the pressure began at once to rise, showing that they had reached the limit of their capability.

Mr. A. Mackay (Montrose) considered they could all agree with what the President had said about "how not to do it," when they thought of his predecessors selling gas at £4 per 1000 cubic feet. But he had certainly shown them also how it should be done, also how it might be done, in supplying cookers free. In his (Mr. Mackay's) opinion, in round figures from £220 to £300 a year was rather a large figure for maintenance purposes. It might include cooking appliances; but he did not think it should, because a cooker would last ten or fifteen years, and therefore they could not put down their initial capital charge for the first year. If they supplied cooking appliances free, they would require to ask a guarantee that so much gas would be consumed. They did this in Montrose; and for any quantity short they made a charge. Certainly the education of the staff was very essential. They could always advise their staff to have patience with their customers, and be courteous to them. They might be educated so as to be able to give comparisons between the prices of gas and electricity. His Company had inaugurated a scheme whereby they supplied gas-engines upon the hire-purchase system. They took the net cost, including fixing, and divided the period of payment into twenty quarters. They had reduced the price of gas to 2s. 6d. per 1000 cubic feet. They had experienced, as doubtless all present had, severe competition in this direction; but, in their town at least, the Electricity Company could not stand against the Gas Company's price of 2s. 6d. He believed the average make of gas per ton of coal in England was 11,177 cubic feet, and the illuminating power 16·6 candles; whereas in Scotland the make per ton was 9878 cubic feet, and the candle power 19·36. He felt that probably Scottish managers were adding a little more coal, to reduce their leakage; but he found this was not so, because the leakage in Scotland was 7·36 per cent., compared with 5·8 per cent. in England, But the coal in Scotland was the better of the two; and perhaps they wanted to take a little more gas out of it, because it was gas they were making, and not residuals.

Mr. D. Vass (Airdrie) related that he had recently had a serious complaint of want of pressure. It was found, however, that it was so great that the gas was going outside instead of remaining inside the mantle. This incident pointed to the need of governors in almost every case; and he considered they were going on right lines in trying to get a uniform pressure of gas throughout the town. This could be accomplished by means of a high-pressure main, and knitting them up at different points. He had for some time been experimenting with automatic street lighting in a small way, and he had not been successful in getting over the differences in altitude. There was a range of about 150 or 200 feet between the highest and the lowest level in their town; and they had

* See "Journal," Vol. CXIII., p. 104.

difficulty, particularly in one section. Before they introduced the high-pressure main, there would be a pressure at the lighting hour in that district of 2 inches; but an hour afterwards it would be only 1 inch. So that any pressure system of automatic lighting fell out of action after the lighting. They had trouble with it; and for this reason he was more inclined to adopt a clockwork scheme. High yields of gas might suit in one district and low yields in another. It might suit some better to take 8000 cubic feet of gas out of a ton of coal, and get residuals, than to force 10,000 cubic feet out of the coal, and have less residuals. With reference to purification, there was one matter he should like to ventilate. The President had referred to so many managers using oxide of iron. Perhaps many of them would notice that in a large works in England they were considering the advisability of reverting to lime. At one of their meetings some years ago, he held that the best method of purification was to take out the sulphuretted hydrogen with oxide first, and afterwards send the gas through one sulphided lime purifier, and finish up with an oxide catch-box. He had not been able to do this for want of boxes; but if anyone had done it, he should like to have his experience.

Mr. YUILL pointed out that in Coventry, where they were considering the advisability of reverting to the use of lime, so as to take out the sulphur compounds, they probably had to deal with three times the quantity of sulphur which they had in Scotland, where it was 14 grains per 100 cubic feet, compared with 45 grains in England. If their English friends could get off with supplying gas with 15 grains of sulphur per 100 cubic feet, they would hear nothing about lime purification.

Mr. VASS explained that he did not advocate going back to lime. He was advocating purifying, as he was now doing, with oxide, and sending the gas afterwards through a lime box.

Mr. H. O'CONNOR (Edinburgh) said he should like to ask Mr. Vass if he could tell the meeting how he would sulphide the lime purifying vessel. They must first of all take out the carbon dioxide, and then the sulphuretted hydrogen would sulphide the lime purifier. The carbon dioxide, if left in, would go forward and foul the lime, and prevent it being used for the purpose of removing the sulphur compounds; and they would never be able to get the lime purifier to act as a sulphide vessel. The method adopted in London was to have, first of all, two purifiers with lime, to remove the carbon dioxide; after that two purifiers with oxide of iron, to remove the sulphuretted hydrogen; and then, two purifiers filled with sulphided lime. By bye-passing the oxide vessels, the gas which had been freed from carbon dioxide would go on to the lime purifiers and sulphide them. In London it was found that it required really eight purifiers to get, with absolute certainty, a reduction of the sulphur compounds, and the removal of the carbon dioxide and the sulphuretted hydrogen. So that it took up a large space, and was a comparatively expensive matter. He thought the ideal system of pressures with regard to lighting was to have absolute uniformity, not only of illuminating power but also of heat values, and absolute uniformity of pressures. The only way in which this could be done was to divide the district into a number of small units, and supply these from a high-pressure main, and then deliver from this main into the different districts at one certain pressure. Then the size of the district must be so comparatively small that throughout it a consumer would receive his gas at one constant pressure, no matter what the requirements of other people in the district might amount to. This would do away with an enormous amount of work of a technical nature which was expended nowadays in the regulation of burners. As long as they had varying conditions, they must have regulators for the gas and air; but if they had constant pressures, and constant calorific values, they could employ a burner which would be capable of being used for all purposes. The variation in the calorific value was, of course, not being taken note of so much as it would have to be; but it was a very important matter when working with inverted burners. A difference in the heat value immediately told upon the heating power of the flame; and the amount of light which was obtained from an incandescent burner varied very considerably, on account of a comparatively small variation in the pressure of the heat value. Of course, the system of districting which had been mentioned would avoid the necessity of providing each customer with a special governor for himself. In regard to the size of purifiers, the figure he had in his mind was one which was laid down many years ago—that 15 minutes of maximum make should be the capacity of them. This would not be a ninety-sixth part of the day's make, because they obtained nearly double the quantity of gas at one time that they got at another; consequently, they must divide by 48 or thereby, which worked out at pretty near the figure which the President had given. There was a lack of knowledge which was common throughout the country, particularly so among writers for the Daily Press. The difference between carbonic oxide and carbonic acid was not understood. In 99 cases out of 100, it was believed that carbon dioxide was carbonic oxide. The public were being constantly informed of the deadly nature of carbonic oxide; and no wonder people were nervous about the use of gas.

Mr. A. C. YOUNG (Arbroath) asked if the President could tell them how much of the allowance for 1000 cubic feet applied to other matters than cookers. In Arbroath, they spent 1·6d. on cookers alone, which they gave free to consumers; and they did nothing whatever in general in helping consumers with incandescent burners. He would like to know what the charge would be per 1000 cubic feet for maintenance. The President asked why so many gas-works in Scotland supplied a high-quality gas. In Arbroath, theirs was fixed by Act of Parliament at 20 candles; and it would take £500 to get this altered. They were a little over the 2·7 of purifier area. Perhaps this might be the explanation of how they were able to purify in the summer months something like 20 million cubic feet of gas, while in the winter months they could only pass about 7 millions. Undoubtedly, the more time the purifier had to act the better.

Mr. G. KEILLOR (Broughty Ferry) said the President was to be complimented on the carbonizing results he obtained at Cowdenbeath. He mentioned that the gas he supplied was of 16-candle power. It would be interesting to know by what test-burner the candle power was ascertained. He did not think that in these times it was necessary to supply gas higher than 16 or 18 candle power. He himself had had no experience with Meunier floats, but thought they were capital things. He was pleased to know that the President got such good results from them, without the intervention of a retort-house governor. If an increase of about 600 cubic feet of gas per ton of coal was to be obtained with these floats, they would be well worthy of consideration. In Broughty Ferry, they introduced a retort-house governor about two years ago, and it had, he thought, repaid itself. He was not in a position to say how much extra they had in return; but apart altogether from this point, the governor gave them such a regular seal that it enabled them to maintain the quality of their gas practically steady. He had not the slightest anxiety nowadays with regard to the quality of the gas. Before the governor was put in, they were at times troubled by over-exhaustion. He did not know whether the Meunier float would act as a similar safeguard. He thought the President's 8 cwt. of coke saleable per ton of coal carbonized was a very good result. When looking through recent published statistics, it was curious to find that there was such a difference upon this particular item. Perhaps a good deal of it was to be accounted for by the fact that some engineers might return, not the amount of coke available for sale (as he thought it ought to be), but the quantity saleable, which was a different thing, and might amount to 2 or 3 cwt. per ton of coal carbonized. They were all very much indebted to the President for putting before them highly interesting statistical information with regard to purification. He did not know whether Broughty Ferry was included in the highest or in the lowest column in regard to superficial area per 1000 cubic feet; but from his own knowledge of purification plant, he thought they would be among the lowest. The purification area with them worked out at 1½ superficial feet per ton; and they did not find any difficulty in purifying their gas satisfactorily with this area. The President spoke of a provision of 4 superficial feet per 1000 feet of maximum daily make, divided into not less than four boxes. He was not quite able to follow this. It read as if the President intended to distribute the area over four boxes. Perhaps he meant that each box should be equivalent to 4 superficial feet.

The PRESIDENT: One each.

Mr. J. W. NAPIER (Alloa) congratulated the President on the wide survey he had displayed in his address. This year, as he had pointed out, was one which would be conspicuous in the annals of gas affairs in Scotland, in so far as they were to have with them the premier Association. Mr. Mackay, of Montrose, mentioned the severe competition he had with the Electric Light Company; but he would point out that there were different conditions and circumstances pertaining to electricity supply as compared with gas supply. With electricity, the day load was of such enormous advantage that they were able to sell their product at one-fourth or one-fifth of the amount they sold current at for lighting purposes. This was simply due to the important effect which capital charges had on the cost per unit. Those who, like themselves, were distributing electricity, had met with great difficulties as regarded the capital cost of distribution; and it was interesting to note that in England a system had been inaugurated in which a number of houses were taken *en bloc*, and no meters were used—the basis of charge being according to the rental paid for the house. But they could understand that with them there was a difficulty in the matter of equity of charge, because the conditions and requirements of lighting and of heating and cooking were so different in different houses that it was a system which could not become popular, and which could in no way appeal to them as gas suppliers. His experience was that those who preferred electricity did not consider price—they felt justified in taking the electric light because of its advantages, apart from the question of price; and it was well worth their bearing in mind that they should not press the question of price. It should rather be their endeavour to follow up the policy of condemning the wrong conception the people had as to the deleterious products, and the disadvantages arising from the combustion of gas. The Cowdenbeath Gas Company were to be heartily congratulated on the excellent system they had in force. Small companies, if they were to make any progress, must, in the first instance, have a low price, and give appliances for heating, cooking, and lighting practically free; but as regards the question of appliances, and as to how far it was reasonable and justifiable to go, he wished to say a word. He understood that in Perth they recently began a system of giving gas heating apparatus of all kinds and descriptions free. He was not prepared to homologate this policy. He was strongly of opinion that only to help a customer by giving him the apparatus, be it a gas-fire or a gas-cooker, to use gas, on satisfactory terms, perhaps free, was not sufficient. This was only, as it were, a half-way house. He was inclined to believe that if they reduced the price of their fuel—and this, surely, was

a dominating factor in the view of the householder, from year to year, in his heating and cooking—this would be the best line to follow, a line which, he thought, was on strict business principles. Those companies who were not able to cheapen their gas to such an extent as to make it satisfactory for heating in an all-round way, must do their best to give the consumers what advantages they could in the way of low rentals and such like. It was well that the question of purification, having regard to the position that the Corporation of Coventry and one of the London Gas Companies had taken up, should have been discussed there; and he was quite of opinion that the position of these bodies had been that they had found it necessary to eliminate from the gas an undue proportion of sulphur compounds in the interests of their undertakings and of their customers. They in Scotland did not require to consider oxide purification, simply because the vast majority of their coals were comparatively free from sulphur, and also from carbonic acid; but he had come across two or three coals with which it was necessary to use lime in so far as the eliminating of carbonic acid was concerned. Reference had been made to the question of illuminating power, and to the returns given in their statistical report. He should just like to say this, that most gas companies were selling gas of a quality that was produced from the coal which was found nearest to their works, which they could obtain cheapest and best, and which they could use without enrichment. As regarded the illuminating power of the gas, some of them would recollect that recently, in an important arbitration case, figures were given in regard to the illuminating power in a number of towns in Scotland. As an individual, and as one of the managers whose gas was tested, he thought that they, as an Association, ought to raise some little objection to the manner in which these tests were made. He did not think it was fair that anyone acting for a gas company whose endeavour it was to make capital out of the position of other gas concerns—and that in a manner detrimental to those concerns—should be encouraged. Personally, he had no sympathy whatever with any itinerant photometrist who went about the country, picking out particular towns; and whether it was his apparatus or his conscience which had disturbed the accuracy of his tests, he was not prepared to say. It was an interesting side-light on the whole issue at least, that the towns to which this expert went were those in which the cheapest gas was sold; and the town which he represented—which he acted for—was one which had been conspicuous for selling gas at a very high rate indeed.

Mr. T. Wilson (Coatbridge), referring to the remarks which had been made with reference to yields of 11,000 cubic feet per ton, and the quality of the gas, said that in Coatbridge they distilled at a low temperature, and they got no more than from 8000 to 9000 cubic feet per ton of coal. He did not know that he had ever touched 9000 feet. Yet he found that they got exceedingly good results. They were restricted to 15-candle gas, and they supplied from 16 to 17 candle power. They used a cheap coal. Last year their average cost was 8s. 8d. per ton, delivered in the retorts. They sold a little over 8000 cubic feet of gas per ton, 11 cwt. of coke, 10 gallons of tar, and they had over 31 lbs. of sulphate. If they were to distil at a higher temperature, they certainly would have less tar and ammonia. They got 1s. 3d. per ton more out of the bye-products than the coal cost them; so that the gas was really a bye-product. This was one of the reasons why Coatbridge stood in the invidious position of selling the cheapest gas. They were now in the position that their capital was only about £400 per million cubic feet of gas made. There were places in Scotland as high as £1200; and although in Coatbridge they paid a large dividend—8 per cent. on the new, and 12 per cent. on the old capital—this only took about 8d. per 1000 cubic feet. He knew that in Dunfermline at one time it took, between interest and redemption charges, 1s. 3d. per 1000 feet. They could not, therefore, make a comparison. Coatbridge was in the position to-day that many of them could not attain to for a considerable time to come. When he went there, thirty years ago, the leakage was 26 per cent. At present he did not think it would be over 5 per cent.; for the simple reason that they were now selling 200 million cubic feet of gas through the same mains that supplied 26 millions. As regarded purification, possibly they would be in the second column. They had large purifiers, 30 feet square—which gave them, he thought, about 1 foot per 1000 cubic feet of their maximum daily make of 900,000 cubic feet.

Mr. W. Ewing (Lochgelly) considered that the only way to cheapen gas was to increase the volume of residuals and decrease the illuminating power. A fuss was made about the illuminating power of the gas. During the past 100 years, millions of pounds had been misspent on illuminating power. Ten-candle gas was good enough.

Mr. J. Napier Myers (Saltcoats) said the question was certainly raised in his mind as to what availed all the technical education they were receiving if the people could not be trusted with bunsen burners. To his mind, British people did not altogether relish the constant attendance of inspectors. They should look to the general education of the community being raised to a level which should do away with the attentions of these men, and do away with this charge of nearly 2d. per 1000 cubic feet in the maintenance of appliances. In Saltcoats, this would amount to an annual charge of about £250, and there would be nothing to put against it.

Mr. W. Grafton (Glasgow) thought it would be an advantage to the consumer if they were to give him a uniform pressure—that was, uniformity throughout the lighting hours, from four o'clock in the morning to midnight. They might have a pressure at one part of a district of from 20-10ths to 40-10ths; but it did not follow that further away the pressure was to be less, although it might have to pass through a smaller main. It all depended on the consumption on this main. With regard to the use and abuse of pressure, he did not think that the pressure alone, as referred to by some of the speakers, had much to do with incandescent lighting. What they wanted with Scotch gas was to burn more air. If they did this, they would have brighter lights. The induction action of the jet, with governors or without, was feeble, and would not take in the quantity of air which was necessary to give better combustion. With governors he did not at all agree. From start to finish they were a source of considerable trouble and expense; and the provision of them was a charge which had to be borne by the consumers.

Mr. W. Wilson (Falkirk) stated that last year they sold 11·8 cwt. of coke per ton of coal. They did not sell any breeze. This was burned in the boiler; and they also used a quantity of coke for heating the retorts. The only gas-works in Scotland, he thought, where they sold a greater quantity of coke than Falkirk was Dundee. The reason these two works sold such a high quantity of coke per ton of coal was that they were working with retorts in big units. They were in settings of twelves. He had found that settings of twelves were the most economical, so far as fuel was concerned; the consumption being almost identical with that of settings of eights adjoining, with the same regenerator. As to distribution in high-pressure mains, he said that 2½ years ago, he laid about 1¼ miles of steel main in 45-feet lengths. They isolated it, and put on a 5-light test-meter. This meter stood stationary for a period of half-an-hour. There was no leakage. The main was laid at a depth of 3 feet; and the joints were very carefully made. With regard to the pressure-wave system of operating street-lamps, his difficulty was lack of control of the initial pressure. In Falkirk, they endeavoured to supply gas at 30-10ths during lighting hours; and when their gasholders were on the single lift, they got barely 3 inches of pressure. To use a pressure-wave system, they would require, he should say, 5-10ths more than the initial pressure. They would have to keep the gasholders continually full, and thus lose half their storage, or put on a booster.

Mr. J. M'Leod (Greenock) said that the question of the area of purifiers was one of very great interest. Some time ago, he had to take out some figures as to purifier area; and on going over the figures given by some authorities, or alleged authorities, he found that there were tremendous discrepancies between them. Taking them all over—Clegg, Hughes, Wyatt, Newbigging, Hunt, and Herring—they varied enormously in the figure given for the area of purifier-boxes. If they took it, as the President had worked it out, that in Scotland the purifier area worked out at a little over 4 superficial feet per 1000 cubic feet of maximum daily make, and that Mr. Newbigging gave an area of about 2·4, they could realize how wanting in anything like definiteness these figures were. The purifier area question was one which must be determined by every gas manager for himself. The fact that some purifiers were 5 feet deep, and they put in possibly about 2 feet of oxide, he thought needed some consideration. What was the effect of the space inside the boxes? Was there any necessity for having a box 5 feet deep if they were going to put in only 2 feet of oxide? Some years ago, he read that the reason for the large space was that it allowed the gas to rest. He did not appreciate this. The subject was one which demanded very close investigation, because he did not think they had arrived at anything like definiteness in regard to the purifier area they should adopt for the amount of gas they were making. There was one authority he had not mentioned—Mr. George Anderson—who gave as the area for the purifier 25 minutes of maximum daily make; but, of course, he did not know his grounds for fixing this figure.

Mr. H. Rule (Kelty) congratulated the President on the quality of his paper. When he (Mr. Rule) went to Kelty, he was somewhat against automatic street lighting; and certainly his first two or three months' experience hardly tended to lead him to alter his opinion. He had a good many failures, due to several causes. Among these were badly-laid service pipes and poor construction of lanterns, which, instead of being fixed on by means of a cast-iron block, were simply set in a wrought-iron cradle, so that, in a gale, the lanterns shook very much, and with disastrous results. He had since improved the system; and now there were very few failures. Whether automatic lighting would pay depended very much on the agreement they had with the local authority. To work the automatic system he required an excess of pressure of 2½ inches; and he had never had any complaint from consumers with regard to this pressure.

Mr. W. F. Vernon (Stonehaven) believed that Stonehaven was one of the pioneers in the matter of automatic gas-lighting; and it was with a feeling of trepidation that he had to follow the gentleman who instituted this system, for he was very sceptical as to the success of it. Experience, however, had proved that the system was good. The Committee of the Town Council who had charge of the lighting had decided to introduce a further installation; but he was asked if there ever had been any difficulty with private consumers over the extra pressure which was necessary to actuate the mechanism. The Convener of the Lighting Committee complained that the extra pressure broke the mantles and glasses in the consumers' houses. He had regularly 2 inches

of pressure, and to make the controllers work they required an extra 2 inches. He found that the number of mantles used with automatic lamps was less than with ordinary lamps. The average was 2½ mantles per season of eight months; whereas with the ordinary lamps they had nearly double this number.

Mr. T. WILSON said that two years ago he put down a new gas-works in Linlithgowshire. There were 64 street-lamps on the automatic lighting system; and there had been no trouble with them. There had been no complaint from private consumers with regard to the breaking of mantles. It took about an inch of extra pressure to actuate the system.

Mr. W. BROWN (Cardenden) related his experience with an automatic lighting system. They lighted the lamps at night with the ordinary day pressure. At eleven p.m. they took off the pressure for about five minutes, and then put it on for about three minutes. They had had very little complaint, and only a few failures. With a view to sending gas to a neighbouring village, they had put in a small compressing plant. They had 152 lamps. During seven months they had had 0·86 of the bye-passes out; the mantles used were 1·45 per lamp; and they had had 420 actuations. They had had no complaints by consumers as to the effect of the extra pressure. They only used an inch of extra pressure over the initial pressure they employed in connection with their night lighting.

The PRESIDENT, in closing the discussion, said that if he had to do the work again he would certainly prefer lead wool for the joints. The cost of maintenance did not include the cleaning of the cookers. It included the re-fitting up—the taking of cookers out of one house and putting into another, the work of cleaning burners, and so on. In Cowdenbeath, the price charged for electricity varied from, he could not tell them what, up to 5d. The Company took 5d. if they could get it; but if they could not get it, they took just what they could. Being near the coal pits was not of very much advantage to them. Perhaps they would be surprised to learn that the coal companies in Fife charged him 1s. 6d. per ton more at the pit than they charged at Perth. They did the same with the Electric Light Company. The remarks on purification had brought out what he expected—that, so far as Scotland was concerned, there was no need to fear for the use of oxide, because they were dealing with a different coal. He thought that Mr. O'Connor spoke on the right lines with reference to uniformity of pressure. Of course, they could not upset the whole distributing system of a town; but any gas engineer who had thoughts of reconstruction, or the laying out anew of the distributing system, would find it far more economical to lay leading mains throughout, connecting with low-pressure mains at points in each section. It was not an easy matter to say what was the proper size for purifier-boxes. This was what led him to trouble so many gas managers in Scotland; just to see what the average would work out at. Even after what had been said, he could not get away from the fact that the average figure he had obtained was possibly about the right thing. He would never think of putting down less, and possibly he would put down more, if there were immediate prospects of business. He supposed it was a matter of how they educated their consumers; but he did not think they would do their business in Cowdenbeath now without a sufficient staff of men to regulate the distribution. The people did not wait till the men went round—they telephoned for them to come. But it was found to be a big leverage, in the fighting of competition with electric lighting, to have men going round keeping the burners in condition. He must admit that they did sometimes have complaints from consumers; but he believed that these were caused chiefly by the way the pressure was put on. If the pressure were put on with a jerk, something was likely to give way somewhere; but if it were put on carefully, he did not see that the increased pressure would do much damage to either mantles or apparatus. He believed that this could be easiest done with a booster. He thanked them for the excellent discussion they had had.

On the motion of the HON. SECRETARY (Mr. W. B. M'Lusky) Mr. J. M'Leod, of Greenock, was appointed President for next year.

Mr. M'LEOD accepted, and was invested with the chain of office.

Mr. A. YUILL proposed that Mr. M'Lusky be re-elected Hon. Secretary, which was agreed to unanimously.

The company afterwards dined in the hotel—Mr. M'LEOD in the chair. There was an attendance of over seventy.

The toasts which were submitted included that of "Kindred Associations," proposed by Mr. J. W. NAPIER, and replied to by Mr. G. KEILLOR (the President of the North British Association); and "Junior Gas Associations," proposed by Mr. G. CLARK (the Managing-Director of the Bryan Donkin Company, Limited), and responded to by Mr. H. RULE, of Kelty.

The proceedings were brought to a close about seven o'clock; having lasted nearly continuously from one o'clock.

The Marseilles Gas-Works have arranged for the erection of six beds (tens) of Dessau vertical retorts—60 retorts in all.

Last night, before the Institution of Sanitary Engineers Mr. L. Gaster delivered a lecture on the "Hygienic Aspects of Illumination and Progress in Illuminating Engineering."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Bicester Urban District Gas Bill, Blackburn Corporation Water Bill, Chichester Gas Bill, Marple Urban District Council Gas Bill, Tamworth Gas Bill, Weston-super-Mare Gas Bill.

Bills reported, with amendments: Chester Water Bill, Felixstowe and Walton Water Bill, Luton Gas Bill, Oystermouth Urban District Council Bill, Sidmouth Gas and Electricity Bill, Winchester Corporation (Electric Supply) Bill.

Bill read the third time and passed: Enfield Gas Bill.

The Kingston-upon-Hull Corporation Bill has been referred to a Select Committee, consisting of Lord Sanderson (Chairman), Earl Fitzwilliam, Viscount Hood, Lord Aberdare, and Lord St. Levan; to meet on Tuesday, the 2nd of May.

The Chapel-en-le-Frith, Chinley, and District Gas Bill, Rhondda Urban District Council Bill, and Swansea Gas Bill have been referred to a Select Committee, consisting of Lord Wenlock (Chairman), the Earl of Lytton, the Earl of Londesborough, Lord Silchester, and Lord Leigh; to meet on Tuesday, the 9th of May.

The Merthyr Tydfil Corporation Water Bill and the Rhymney Valley Water Board Bill have been referred to a Select Committee, consisting of the Duke of Northumberland (Chairman), the Earl of Leven and Melville, Earl Cathcart, Viscount Hampden, and Lord Dawnay; to meet on Tuesday, the 9th of May.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill read the first time and referred to the Examiners: Enfield Gas Bill [Lords].

Bill read a second time and committed: Slough Urban District Water Bill [Lords].

Bills reported, with amendments: Chesterfield Gas and Water Board Bill, Hornsea Urban District Council Bill, Northampton Corporation Bill, Paignton Urban District Council Bill.

Bills read the third time and passed: Bicester Urban District Gas Bill, Blackburn Corporation Water Bill, Chichester Gas Bill, Marple Urban District Council Gas Bill, Tamworth Gas Bill, Weston-super-Mare Gas Bill.

The Ashborne Urban District Council have presented a petition against the Ashborne and District Gas Bill [Lords], which stands for second reading to-day.

The Slough Water Company have presented a petition against the Slough Urban District Water Bill; and the Lichfield Gas Company have withdrawn theirs against the Chasetown Gas Bill.

Cutting off Water During Repairs.

In the House of Commons last Tuesday, Mr. Harry Lawson asked the President of the Local Government Board whether he was aware that in certain cases the Metropolitan Water Board had cut off the supply of water from premises during repairs without giving notice to the householder concerned; and whether he would introduce legislation to restrict the Board's power to take such action. Mr. Burns, in reply, said he was informed by the Board that their practice was to give notice, whenever possible, that the water was to be cut off during the execution of repairs. In some cases, however, repairs had to be done at once, and it was impossible to give notice.

BIRMINGHAM GAS AND WATER ANNUITIES.

In the course of the proceedings last Thursday on the Greater Birmingham Bill before the Committee of the House of Lords, presided over by Lord CROMER, the question of the insertion of a clause for the protection of the gas and water annuities granted by the Corporation came up for consideration.

Mr. J. KENNEDY (Parliamentary Agent) asked for the insertion of a special clause for the protection of the priority of the gas and water annuities granted by the Birmingham Corporation in consideration of the transfer to them of the Birmingham and Staffordshire gas and water undertakings under the Act of 1875. Under this Act, the security for these annuities was, first of all, the revenue of the undertaking, and, secondly, the borough rate. Since the transfer, Birmingham had from time to time applied to Parliament and the Local Government Board for further powers; and a similar clause to the one now asked for had been inserted. He understood that the Local Government Board had no conscientious objection to the clause—their objection was rather what might be called a technical one. Mr. Wood (representing the Local Government Board) doubted whether the clause was necessary; but he (Mr. Kennedy) thought the Committee would agree that it was. These annuities had now a very high market value. They fetched about 31 years' purchase; and anything that would throw any doubt upon the value of the security would be a very serious thing. In all the Local Government Board Orders passed since these annuities were granted, in 1880, 1881, and 1882, clauses had been inserted giving priority to the annuities; and in 1883, when the Birmingham Corporation Consolidation Act passed, a similar clause was inserted. So also in the Consolidation Act of 1892 and in the General Act of 1905 clauses were inserted for the protection of the priority of the gas and water annuities. There had, therefore, been a continuity of this clause through all the various Acts and Orders. His clients were afraid that the omission of such a clause from this Act might throw some doubt on the value of the securities given them in the preceding Acts. He understood Mr. Wood was doubtful whether it was necessary that an Act which simply extended the boundary of

the borough should contain this clause. It was not, however, certain that the enlarged area would mean enlarged revenue. It was quite possible the increased expenses might exceed the increased revenue.

Mr. HONORATUS LLOYD, in reply to the Chairman, said the promoters had no feeling on the point one way or another.

The CHAIRMAN: I understand the Local Government Board have no conscientious, but some technical, objection to urge.

Mr. WOOD: The only objection we have is that we regard the clause as absolutely unnecessary.

The CHAIRMAN decided to admit the clause; and the Bill was eventually ordered to be reported, as amended, to the House of Lords.

METROPOLITAN WATER BOARD (NEW WORKS) BILL.

Grand Committee Room, Westminster Hall.

(*Before the Earl of* KINTORE, *Chairman*, *Lord* SEATON, *Lord* GOUGH, *Lord* MARCHAMLEY, *Mr.* J. A. DAWES, *Mr.* J. H. DUNCAN, *Mr.* H. INGLEBY, *and Mr.* B. STANIER.)

The proceedings on this Bill, with which is being taken the Thames Conservancy Bill, were resumed on Monday last week. The inquiry was opened on the 29th ult., as already reported (*ante*, p. 45.)

Mr. BALFOUR BROWNE, K.C., Hon. J. D. FITZGERALD, K.C., Mr. COURTHOPE MUNROE, and Mr. W. B. HARBINSON are conducting the Water Board's case; and the petitioners against the Bill are represented by a strong array of Counsel, including Lord ROBERT CECIL, K.C., Mr. FREEMAN, K.C., Mr. HONORATUS LLOYD, K.C., Mr. C. HUTCHINSON, K.C., and Mr. G. J. TALBOT, K.C.

Mr. *W. B. Bryan*, the Board's Chief Engineer, who had been under examination and cross-examination on the previous Thursday and Friday, was cross-examined by Mr. HUTCHINSON on behalf of the Eton Rural District Council. Witness dissented from Counsel's assumption that the district might look forward to periods of general submergence if the scheme were carried out, and said that, so far from preventing a flood finding its natural way down to the river, the Board had provided a cut which would give the necessary relief. The proposed reservoir No. 3 would not decrease the flow of flood water through the gravel; and there would be no interference with the water at Wraysbury Mill.

In cross-examination by Mr. TALBOT, representing owners of property on the east side of reservoir No. 4, near Runemede, witness said the nearest part of the embankment would be a quarter-of-a-mile from the manor, and would be hidden by cottages. He would not admit that there would be danger of extra flooding from the proposed works.

Mr. CLODE, on behalf of Mr. Richard Burbidge, of Littleton House, pointed out that it was proposed to construct two reservoirs partially on the existing timbered land, and to take about 600 of the 800 acres which comprised the estate. Witness said he did not think the amenities of the place would be interfered with as much as Counsel feared, or that the divergence of the River Ash would cause a considerable amount of flooding. The two reservoirs proposed to be constructed near Littleton would not be made for eighteen years. Asked if, assuming an unfavourable decision were given in regard to the other reservoirs, the two reservoirs near Littleton would be necessary, witness said he should still propose that they should be made at some future time.

In reply to Mr. CHARTERIS, representing the authorities of Eton College and the Windsor Corporation, witness described the works in relation to reservoirs Nos. 1, 2, and 3, and the cut arranged to carry off flood water. He said the setting back of reservoir No. 2 was settled after conference with local authorities, mainly on the ground of the amenities of the locality.

Replying to questions on the petition of the Wraysbury Parish Council, witness said that about 600 out of the 1800 acres of the parish would be occupied by reservoir No. 1 and parts of Nos. 2 and 3; and that during construction the Board would not be liable for poor-rate and land-tax. About 10,000 men would be employed on the construction of the reservoirs in the neighbourhood.

In answer to further questions, witness said the arrangements in respect to reservoirs Nos. 1 and 2 had been modified to meet the view of the War Office in regard to the rifle range; and the facilities of the Metropolitan Rifle Association would not be interfered with. In fact, the embankment would afford an additional protection for the public from stray shots. There was no intention to restrict the rights of the Colne Valley Water Company within their area of supply.

At this point the Committee adjourned; but before this was done, it was announced that, with the exception of Wednesday, when they would visit the *locus in quo*, they would sit till the following Monday (yesterday), and then adjourn until Tuesday, the 25th inst.

On the resumption of the inquiry on Tuesday,

Mr. *Bryan* was re-examined by Mr. COURTHOPE MUNRO on the question of the danger of pollution of the water from the Windsor sewage farm opposite the intake at Datchet. He said effluent water from the sewage farm would pass into the river considerably below the proposed intake and through gravel. Samples of water had been taken over a considerable period, and were found innocuous. He had examined the suggested scheme for reservoirs to the eastward of those proposed in the Bill, and found the alternative would cost £941,400 more.

Mr. *E. B. Barnard*, the Chairman of the Water Board, was the next witness. In answer to Mr. J. D. FITZGERALD, he said that, after considering various schemes, the Board came to the same conclusion as two Royal Commissions—viz., that the Thames was the source to which they must look for an increased supply of water for London. When the first instalment of the proposed works was completed in 1916, there would be storage for about 27 days' supply; and as additional reservoirs were constructed later on, the storage would go up to more than 90 days' supply. Not only did experience bear out the reports of the Royal Commissions that the Thames was a suitable source of supply for London, having regard to the quality of its water; but it also taught that storage still further improved it. Questioned with regard to the flow of water over Teddington Weir, witness said the Board had the unrestricted right to take 130 million gallons a day, whatever the state of the river. An agreement had been come to with the Thames Conservancy, under which, subject to the consent of Parliament, the Water Board gave up this unrestricted right, and the condition was imposed that they should not take any water out of the Thames unless there were 140 million gallons a day flowing over the weir. It was agreed that the quantity of water the Board might take should not exceed an average of 300 million gallons a day, and that they should not take more than 1200 million gallons in any one day. The average daily flow over Teddington Weir was something like 1350 million gallons a day. If the Board gave up their unrestricted right, the state of the river would be greatly improved on days when the flow was poor. It was absolutely necessary that immediate action should be taken for the purpose of securing a further supply of water for London. The Board's parliamentary powers were practically exhausted; and the present supply would apparently only carry them on till about 1917. The Board had been able, however, to economize slightly in regard to the use of water; and the population had not grown quite so fast as was estimated. But, practically speaking, the existing supply would only suffice till 1919. It was calculated that, should the Bill go through, five years would be required to bring the present proposals into operation. Dealing with the question of the amenities of the Thames Valley and the effect of the construction of the proposed new reservoirs, witness pointed out that the Board had given the matter careful consideration, and had made it known publicly that they would do everything in their power to render the reservoirs as sightly as possible. The scheme was the most economical one they could adopt, and, as far as they could see, the one which was most likely to be self-supporting.

The witness was subject to considerable cross-examination by Counsel representing various petitioners—among others the South-West Suburban Water Company—whose right to take water from the Thames would, it was thought, be affected by the proposals contained in the Bill.

Mr. BALFOUR BROWNE having re-examined witness on certain points raised in the cross-examination, he left the chair.

Mr. *Walter Hunter*, M.Inst.C.E., was then called. He related how, in conjunction with Mr. Fraser, the Engineer of the Grand Junction Water Company, he prepared the scheme of reservoirs in the Thames Valley which received the sanction of the Royal Commission of 1892-3 presided over by Lord Balfour of Burleigh, which resulted in the construction of the existing reservoirs at Staines. He said he examined the proposals contained in the Bill, and generally approved of them. The modification upon the Royal Commission scheme did not affect the principle of storing a large quantity of water in reservoirs at flood time, which would be available for use when the flow of the river was limited. The present proposal was generally sound, the estimate of cost reasonable, and the quality of the water excellent.

On the resumption of the inquiry on Thursday morning,

Mr. *Hunter* was further examined by Mr. J. D. FITZGERALD with regard to the effect of the Board's proposals on the amenities of the Thames Valley. He stated that when the Staines Reservoirs Bill was before Parliament, there was a considerable stir in regard to the amenities of the locality; but he did not think they had been injured by the construction of the reservoirs. He agreed that reservoir banks could be greatly improved, and said there was no objection, from an engineering point of view, to planting trees at the bottom of the embankments. Asked if he thought the proposed scheme would injure the district, he replied that he considered it would "vary the landscape a little."

The witness was cross-examined by a number of Counsel; but he adhered to his statement on Tuesday that the proposed scheme was a good one, and was necessary for the supply of water to London.

Mr. *Henry Rofe* and Mr. *E. M. Eaton*, M.M.Inst.C.E., also gave evidence in support of the scheme.

Mr. *James Hampton*, the Chief Inspector of the Thames Conservancy Board, stated that for twelve years samples of water had been taken every two months above and below the proposed intake at Datchet, in addition to others obtained at special times; and there had been no difference, generally speaking, in the condition of the water above and below the Windsor sewage farm.

Dr. *A. C. Houston*, the Director of Water Examination to the Metropolitan Water Board, stated that though the Thames was polluted, it did not contain the germs of water-borne disease except in very small numbers. If it contained them in numbers far exceeding anything that was probable, adequate storage would effect their destruction, and give a safe water, even without filtration, for which the scheme provided. In the present case, they proposed to have the double precaution of storage and filtration. He had made the experiment of adding typhoid bacilli to raw river water, and 99·9 per cent. of them perished within one week.

On the resumption of the inquiry on Friday,

Lord ROBERT CECIL, who appeared for the Hertfordshire County Council, informed the Committee that a settlement between that authority and the promoters had been arrived at.

Mr. *Arthur Newton*, the Accountant to the Water Board, was then called, and submitted estimates of the future progress of the Board's capital expenditure and of its income and expenditure on revenue account. He said the increase in population provided for by the scheme up to the year 1941-2 was 4,900,000; and the estimated increase of capital expenditure within the same period in respect of future supplies, extension of mains, and other works, was £11,188,000. To produce this sum, issues of stock to the amount of £12,486,360 would probably be necessary, representing a capital sum of £2 15s. 6d. per head of the added population, compared with the original cost of £7 14s. per head of the population at the time of the acquisition of the undertakings from the Water Companies. He estimated that the deficiency on revenue account would decrease from £115,997 in 1911-12 to £26,795 in 1918-19; and that the following year there would be a surplus of £7696, which would augment in succeeding years. But after a time a deficiency would result as a consequence of the issue of new capital. In 1927-8, he calculated that there would be a surplus of £33,289, and that the following year it would increase to £73,492; and

he thought the increase would continue from that time. The extension of the present undertaking must be more profit-bearing than was the one which the Board acquired; and it was to this extension that the Board must look for an improvement in their financial position. As a commercial transaction, the scheme embodied in the Bill was an exceedingly good one for the water consumers.

Dr. *Houston*, recalled, stated, in reply to a member of the Committee, that, assuming there was an epidemic at Windsor, and the sewage-tanks suddenly overflowed at a particular point, there was just a bare possibility that sewage matter would find its way into the reservoirs. This would be a serious thing; but, even then, he thought storage would destroy the microbes.

This evidence concluded the case for the promoters.

The room was then cleared to allow of a conference between the members of the Committee. On the re-admission of the parties,

The CHAIRMAN said: Without expressing any opinion on the scheme as a whole, we think it proper to announce at this stage that, after giving our careful consideration to the promoters' case, we are unable to agree to the construction of reservoirs Nos. 1 and 2. To give all parties time to consider their position, we will adjourn until April 26, when we desire to hear the case for the Thames Conservancy Bill.

The original scheme provided for eight reservoirs. The promoters abandoned a small one (No. 8) between Walton and Shepperton; and the Committee have rejected the two in the neighbourhood of Wraysbury, which were designed to hold 5000 million gallons.

APPLICATIONS FOR LETTERS PATENT.

7561.—HARROP, G., "Inverted burners." March 27.
7597.—KEMPSON, E. W. E., and MORSE, J. A. V., "Measuring and recording the depth, pressure, and rate of flow of liquids." March 27.
7627.—PEACOCK, W. B., "Ignition of gas." March 27.
7640.—ZSCHOCKE, H., "Filters for separating suspended impurities from gas." March 27.
7646-7.—HANSEN, H., and PARKER, J. W., "Spraying water for washing gases." March 27.
7677.—KENT-JOHNSTON, A. G., "Lighting and extinguishing gas-lamps." March 28.
7706.—BRANCKER, R., and HUNTLEY, G., "Receiving, conveying, and delivering coal, coke, and other materials." March 28.
7726.—BERRY, J., GLOVER, W. T., and METERS LIMITED, "Gas or fluid meters." March 28.
7727.—BERRY, J., GLOVER, W. T., and METERS LIMITED, "Recording or indicating mechanism of gas-meters." March 28.
7728.—BERRY, J., GLOVER, W. T., and METERS LIMITED, "Gas regulating and controlling means." March 28.
7754.—ZSCHOCKE, H., "Purifying and cooling hot gases." March 28.
7783.—GREENWOOD, P., and CHEW, W. "Purifiers." March 29.
7858.—HUSSON, E., "Automatic lighter." March 29.
7885.—ATKINSON, C. W., "Coin-freed gas-meters." March 29.
7900.—HADDRELL, F. W. D., and SCHUER, F. W. E., "Incandescent gas-lamps." March 29.
7911.—ROWELL, J. & R. H., "Air-gas generators." March 29.
7922.—KUNICK, G. H., "Incandescent burners." March 30.
8005.—HOLZAPFEL, A. C. A., "Gas-producers." March 30.
8007.—WEIL, J. A., "Distilling tar." March 30.
8105.—STETTINER CHAMOTTE FABRIK AKT.-GES., "Doors and closing mechanism of gas-retorts." March 31.
8127.—CARPENTER, C., and CHANDLER, D., "Supporting shades or globes of inverted lamps." March 31.
8135.—GLOVER, T., "Fuel for gas-fires." March 31.
8136.—GLOVER, T., "Gas-meters." March 31.
8196.—O'NEIL, H. A., "Joints for pipes." April 1.

Lamplighters and Window-Cleaning.

Alderman R. Dart, at the meeting of the Liverpool City Council, inquired about a resolution prohibiting certain men in the Lighting Committee's service from doing private window-cleaning. He said he did not learn that they were prohibited from doing other kinds of work in which they might equally interfere with the labour of other classes of workers. There seemed to be no objection to them acting as bearers at funerals; and why they should be prevented from cleaning windows, he could not understand. Sir Charles Petrie replied that there was a complaint received by the Lighting Committee from some Window-Cleaners' Association, that Corporation lamplighters were cleaning windows at a lower rate than the Association recognized, and that Corporation ladders and material generally were used for the cleaning of windows. There was no truth in the suggestion that Corporation ladders or other material were employed. So far as the amount of payment asked for the cleaning of the windows went, it was a severe competition with the men who made a living in this way; and the Lighting Committee felt that, as the lamplighters had a permanent wage, it was only fair to meet the objection raised. They therefore passed the resolution precluding their lamplighters from cleaning windows. Some discussion took place; but, after two amendments had been defeated, the Committee's recommendation was passed.

Torquay Public Lighting.—The annual report of Mr. H. A. Garrett, the Borough Surveyor of Torquay, shows that there had been used during the twelve months ending on the 31st of December 3072 mantles for 440 incandescent burners—an average of seven per lamp; the cost per mantle being 2¾d. each. The total quantity of gas consumed from Christmas, 1909, to Christmas, 1910, was 10,004,856 cubic feet, compared with 9,787,610 cubic feet the previous year. Though the total consumption was greater, owing to the larger number of lamps, the average per lamp was less. The total consumption of gas in the St. Mary Church district for 220 lamps was 2,204,798 cubic feet. The cost of gas per 1000 cubic feet for the past year was 2s. 11d. in Torquay; but this is now reduced to 2s. 10d. In St. Mary Church the cost is standing at the same figure as previously—viz., 3s. per 1000 cubic feet.

LEGAL INTELLIGENCE.

OPENING ROADS WITHOUT NOTICE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.—April 6.
(*Before the* LORD CHIEF JUSTICE *and Justices* BRAY *and* BANKES.)

Redhill Gas Company v. Redhill Rural District Council.

This was an appeal from a decision of the local Magistrates, who convicted the appellants and inflicted a penalty for a breach of section 8 of the Gas-Works Clauses Act, 1847, by opening a certain road for the purpose of laying a main, without giving notice to the respondents, the Rural District Council. The proceedings in the Court below were reported in the "JOURNAL" for Nov. 15, 1910 (p. 508).

Mr. MACMORRAN, K.C., and Mr. BETHUNE appeared for the appellants; Mr. C. A. RUSSELL, K.C., and Mr. MACKENZIE represented the respondents.

Mr. MACMORRAN said the point in dispute was very simple. The road in question was made in the year 1905, and had been dedicated to the public, so that it became a highway. But it had never been taken over or become reparable by the inhabitants, and the District Council had no jurisdiction over it in the way of repair. The question was whether, before opening, notice had to be given to the District Council, as being the persons who, in the words of the section, have the "control or management" of the road. Counsel read the case stated, which set out the facts; the contention being, on behalf of the appellants, that the respondents were not persons having the "control or management" of the road within the meaning of the section, because it was not reparable, and never had been repaired, by them. On behalf of the respondents, it was contended that the road in question was a "street" within the meaning of the Act; that it was under their control, although not yet reparable by them; and that therefore it was the duty of the appellants to give them notice of their intention to open the roadway. The Magistrates were of opinion that, having regard to sections 25 and 26 of the Local Government Act, 1894, all highways, whether reparable by the public or not, were under the "control or management" of the respondents, and that therefore notice should have been given. The question for the opinion of the Court was whether they had arrived at the right conclusion. Having read the sections of the Act of 1847 which in any way bore on the question, Counsel submitted that the words had reference to repairing and to nothing else; the object being evidently to protect the persons whose interests might be affected by the surface of the road being in any way interfered with. He cited *Reg. v. Wilson* (18 Q.B.), in which it was held that the owner of a road which he had dedicated to the public was not liable to repair it; and that, not being so liable, he was not the person having the management of the road within the meaning of a similar clause in the Railways Clauses Act, 1845, and could not recover penalties against a railway company who made a cut across the road and rendered it impassable. He also cited *Hill v. Wallasey Local Board* (1Ch. 133),* which dealt with a similar section (28) of the Water-Works Clauses Act, 1847. In the course of his argument (which, owing to various questions put from the Bench, occupied a long time), Counsel admitted that all the powers and duties of a Surveyor under the Highways Acts were, by the Public Health Act, 1894, transferred to the District Council; but he submitted with confidence that before this Act was passed there was no obligation on the appellants, in such a case as the present—*i.e.*, of a road not reparable by the public—to give any notice to the Surveyor of Highways.

Mr. RUSSELL, on the other side, said the argument of his learned friend came to this—that the words "having control or management" really meant, "having the liability to repair;" and that unless some person so liable could be found, there was no one who had the "control or management." He submitted at some length that the Highways Act, 1835, really, by its various sections, gave the control or management of the highways to the surveyor; that control was something quite different from liability to repair; that the District Council, by the Act of 1894, were the successors of the Surveyor, and had such duties imposed upon them for the protection of all roads dedicated to the public as gave them the control or management; and that therefore they came within the section cited.

Mr. BETHUNE, in reply, pointed out that a sanitary authority had the right to abate a nuisance if the owner of the property neglected to do it himself after due notice; but he submitted that this did not give them the control or management of the property.

Mr. Justice BANKES said he found himself not in accord with his brethren, and therefore he gave his opinion with some diffidence; but, having formed it, he was bound to express it. He thought the Act of 1847 contemplated that there would be some person in control or management of every street; and he also thought that the various powers conferred on the Surveyor by the Act of 1835 constituted him the person having the control or management of a road of this kind. The powers of the Surveyor had been transferred to the District Council; and for these reasons he thought that the Magistrates had come to a right conclusion.

Mr. Justice BRAY said the words "control or management" did not seem to have been in general use at the time, and they had to construe them as well as they could. The Act of 1835 gave the Surveyor certain special powers, to be exercised in special circumstances. But this could not be said in any sense to give him the control or management; and in some cases he could only exercise it by obtaining an order from the Justices. He based his decision on the conclusion to which he had come, that the Surveyor of Highways in 1847 had not the control or management of highways not reparable by the public. He did not think the District Council had any further powers; and therefore he was of opinion that this conviction could not stand.

The LORD CHIEF JUSTICE said he agreed with the view expressed by Mr. Justice Bray, and with the reasons he had given. The appeal would therefore be allowed, and the conviction set aside, with costs.

* See "JOURNAL," Vol. LXIII., p. 25.

THE EATON GROUP OF COMPANIES IN COURT.

In the Chancery Division of the High Court of Justice last week, Mr. Justice Warrington was engaged for three days in trying an action brought by the Ticehurst and District Water and Gas Company against the Gas and Water Works Supplies and Construction Company, Limited, and four Directors of the Ticehurst and Robertsbridge Water Company, or of the plaintiff Company—Messrs. Eaton, White, Martin, and Wheeler; the East Sussex Gas and Water Company, Limited, and Mrs. Bowman, as representing the debenture-holders of that Company; and Mr. Robert Locke, as representing the debenture-holders of the plaintiff Company. The action was brought for a declaration that an agreement, dated Dec. 21, 1904, made between the Ticehurst and Robertsbridge Water Company and the Gas and Water Works Supplies and Construction Company, Limited, was *ultra vires*, and a fraud upon the plaintiffs. The benefit of the agreement had been assigned to the East Sussex Company; and the plaintiffs asked that the document might be delivered up and cancelled. They sought an injunction to restrain the East Sussex Company from using mains, pipes, &c., which were put down under the agreement, and which were part of plaintiff Company's undertaking. They also asked for an account of the water-rates received by the Company named, for an account of the profits made by Messrs. Eaton, White, Martin, and Wheeler, and for payment of the amount found due. Damages were claimed against these four defendants for alleged misfeasance in entering into the agreement, which, it was suggested, they did for personal gain. For the following particulars of the case, we are indebted to full reports in the "Financial News" and "Financial Times."

Mr. H. Terrell, K.C., and Mr. A. B. Marten (instructed by Mr. Matthew J. Jarvis, of Finsbury Square) appeared for the plaintiffs; Mr. Clauson, K.C., and Mr. Ward Coldridge for the East Sussex Gas and Water Company; Mr. Maugham represented Messrs. Wheeler and Martin. The Gas and Water Works Supplies and Construction Company, Limited, and Mr. Edmund Eaton did not appear; but Mr. Eaton had put in a defence. Towards the close of the plaintiffs' case, however, Mr. Terrell informed his Lordship that he had come to an arrangement with Mr. Maugham not to proceed against his clients. "Eaton was the man he wanted;" and he was not there.

Mr. Terrell, in opening the case, said the whole story was exceedingly complicated through the manipulations of Mr. Eaton. The Ticehurst and Robertsbridge Water Company was incorporated by Act of Parliament on July 22, 1902, for the supply of water to the districts named. It was formed by a Mr. Preston, who at the same time formed another Company for the supply of gas within very much the same area. The two Companies did not flourish. They were in low water in 1904; and Mr. Preston seemed to have handed the matter over to Mr. Eaton, who obtained an Act of Parliament, which was passed on July 22, 1904, for the purpose of amalgamating the two undertakings. By the same Act he obtained for the original Ticehurst Water Company power to extend the area of their operations, so as to include the township and parish of Heathfield. Having obtained the Act, they proceeded to make use of the power of extension for the benefit of Mr. Eaton and the gentlemen who were operating with him. They proceeded to do so by, first of all, entering into the agreement of Dec. 21, 1904. For the purpose of the agreement, they formed another Company—the Gas and Water Works Supplies and Construction Company. At the date of the agreement, the Directors of the Ticehurst Water Company were Dr. White, Mr. Eaton, and Mr. Martin; and the Directors of the Construction Company were Dr. White, Mr. Eaton, Mr. Martin, and Mr. Wheeler. These four gentlemen held the whole of the shares. The agreement, which had been lost, provided that the Construction Company should proceed to construct, and should, within five years, complete, all or such of the main or other pipes and works as they might deem necessary. From and after the completion of the works, the Water Company were to sell to the Construction Company, and deliver in bulk, such supply of water as the latter Company might require, the Company to pay to the Water Company at the rate of 6d. per 1000 gallons. Counsel said he would show that the cost to the Water Company was 1s. per 1000 gallons. They were handing over the whole undertaking to the Construction Company, who were to lay mains, levy and receive the rates, and pay 6d. per 1000 gallons for the water, which was to be given to them in bulk at the boundary of the parish of Heathfield. The Water Company were at all times during the term of the agreement, if and when required by the Construction Company, and at the expense of the Water Company, to put in force any of the statutory powers vested in them under the Acts of 1902 and 1904, and execute and do such other things as the Construction Company might reasonably require. For the purpose of laying the mains, the Water Company's compulsory powers were resorted to by the Construction Company; and this, he submitted, was a delegation of powers that was not allowed. The Construction Company were to decide what mains were to be laid; and the Water Company were handing over to them the whole of their authority, powers, and rights. This was how the substratum was laid for making a profit for the Construction Company, who did nothing. They entered into a similar agreement with regard to the supply of gas in the neighbourhood; and they sold the two agreements to the East Sussex Company for, in round figures, £18,000. A business was carried on by Mr. Eaton and others, under the name of the Gas and Water Works Supplies and Construction Company; and on Sept. 1, 1904, they registered a Company, under the same name, under the Companies Acts. On the same day, there was filed a consent by Messrs. Eaton, White, Martin, and Wheeler to be Directors of the Construction Company. The capital was £10,000, divided into 10,000 shares of £1; and there was an agreement selling the business from the unincorporated Company to the incorporated one. According to the first return to Somerset House, 5705 shares were issued; 5500 being issued otherwise than for cash, and 205 were taken up subject to payment in cash. The shareholders were: White, 50; Martin, 50; Eaton, 50; Wheeler, 50; White and Eaton jointly, 1314 ordinary and 4000 preference; and there were other shareholders. Difficulty had been experienced in obtaining information with reference to the Construction Company. The plaintiffs had endeavoured to serve a subpœna on Mr. H. P. Davis, the Liquidator and former Secretary of the Company; but they had been unable to catch him either at his office or at home. Eventually, however, the subpœna was left with a clerk, who, it was understood, had handed it to Mr. Davis. The plaintiffs had also been told that the books, papers, &c., of the Construction Company had been destroyed. The East Sussex Company had been served with notice to produce the books, papers, and so forth, and particularly the agreement.

Mr. Clauson said he could put Mr. Brown, the Receiver of the East Sussex Company, into the box; and he would produce what purported to be a copy of the agreement.

Mr. *Brown* was then called, and said that when he took over the receivership he could not find a number of documents. He went to see Mr. Davis and asked him if he had a copy of the agreement. He procured for witness the agreement from Mr. Locke, who was the Secretary of the Ticehurst Company, and of this his (Mr. Brown's) clerk made the copy produced.

At the close of the plaintiffs' case,

Mr. Terrell, in answer to his Lordship, said, with regard to Eaton, he asked for an account of the profits made by him in connection with the agreement and its subsequent sale to the East Sussex Company, and for a declaration that he, as the Managing-Director of the Ticehurst Company, was guilty of misfeasance in entering into the agreement, and that he was liable to the plaintiff Company in damages for such misfeasance. With regard to the East Sussex Company, he (Counsel) wished to be quite frank. The plaintiff Company had exhausted their capital and their borrowing powers; and if the agreement was held to be valid, they were under a serious liability. Supposing they were to go before an arbitrator, who found that the proper sum the plaintiffs had to pay was £2500, they would have to go to Parliament to enable them to get the money. In default of being able to find it, the East Sussex Company continuing in possession of the water-works in Heathfield parish, the plaintiff Company would not be able to supply the water which the Statute imposed upon them. He thought the plaintiffs were entitled to a declaration as against the East Sussex Company that the agreement was *ultra vires* and illegal, as against public policy, and contrary to the provisions of the Statute.

Without calling upon Mr. Clauson to reply,

His Lordship gave judgment. He said the action was a most extraordinary one; consisting of two perfectly separate causes of action. First, the plaintiffs sought to have a declaration that an agreement between them and the Construction Company was *ultra vires*, a fraud, and in no way binding upon them; and they asked that the agreement should be cancelled. Secondly, they claimed against certain Directors of the plaintiff Company for misfeasance, and for damages, and an account of the profits which they had respectively made by their misconduct. Having reviewed the facts brought before him by the learned Counsel, his Lordship said, with regard to the first part of the action, he saw no reason to hold that the agreement was *ultra vires* as regarded the plaintiff Company or not binding upon them, though there might be clauses in it which, for reasons of public policy or otherwise, if it was sought to enforce them, the Court might hold to be not binding on the Water Company. He should accordingly give judgment for the East Sussex Company and Mrs. Bowman, with costs. As against the defendants Eaton and White, he declared that they were guilty of misfeasance and breach of trust in causing the plaintiff Company to enter into the agreement, and that they were liable to account to the plaintiffs for any profits made by them from or by reason of it, and to pay them damages. As to both of these defendants, there would be an inquiry as to the profits, with costs, against them. As to Martin and Wheeler, they were dismissed from the action, without costs. Mr. Locke, the remaining defendant, was with the plaintiffs as a debenture-holder.

Messrs. Duxbury Successful in their Demurrage Action.

The House of Lords last Thursday delivered judgment in the case of *Duxbury v. Owners of the "August Leffler,"* which was an appeal from the judgment of the Court of Appeal reversing a decision of the Court of Admiralty which confirmed a judgment of the Judge of the Liverpool County Court in an action brought by Messrs. Duxbury and Co. to recover damages for breach of contract with reference to 600 tons of coal shipped on board the above-named vessel and consigned to a firm in Norway. The case has already been noticed in the "Journal." Messrs. Duxbury obtained judgment for £210 for breach of contract relating to the carriage of the goods. A question of demurrage, in addition to several other points, was involved in the case, which was argued some time ago before the Lord Chancellor and Lords Halsbury, Atkinson, and Mersey. Their Lordships now allowed the appeal, and ordered respondents to pay the appellants' costs; the Lord Chancellor remarking that the shipper had to part with money to get his goods when they arrived in Norway in consequence of the Master of the vessel having made a certain statement on the bill of lading, and that the shipper had had to pay money he was not liable to pay. Messrs. Duxbury must be congratulated on the success of their appeal.

Action in Respect of Defective Meters.

The well-worn question of defective meter registration recently came before the Judge at the Croydon County Court on a claim made by the Croydon Gas Company for £2 19s. 10d., the balance of an account for gas supplied to Mr. A. A. Neill. The claim was admitted subject to a counterclaim for £2 8s. 11d., damages stated to have been sustained by the defendant through the Company putting in a defective meter. There were two meters concerned in the case. The first—a new one—was put in five years ago; and, on complaint being made in respect of its registration, it was found to be working fast. The Company made allowance for this, removed the meter, and put in another. This also went fast, and a further allowance was made. Though this meter was not a new one, it registered within the limit allowed by the Sale of Gas Act when it was tested before being fixed. His Honour, while expressing sympathy with the defendant, said he could not give judgment for him on the counterclaim, as there was no evidence to show that either of the meters was wrong when it was put in. The Company were consequently successful.

MISCELLANEOUS NEWS.

BUSBY GAS PROVISIONAL ORDER.

Board of Trade Inquiry.

At the offices of the Board of Trade, an inquiry has been held by Mr. JAMES MACDONALD, on the Busby Gas Provisional Order, which seeks to empower the Busby and District Gas Company to maintain and continue their existing works, which are situated in the parishes of Cathcart and Mearns, in the County of Renfrew, and to supply gas within part of the parish of Mearns and parts of the parishes of Kilbride and Carmunnock.

Mr. JOHN KENNEDY, W.S., appeared for the promoters of the Order; Mr. WAKEFORD and Mr. STENHOUSE represented the Glasgow Corporation, Mr. THOMAS MUNRO the Lanark County Council, and Mr. G. G. HAWKINS the Renfrew County Council.

Mr. KENNEDY explained, on behalf of the Company, that the application was made under the Gas-Works Facilities Act of 1870. There was nothing special in the provisions of the Order itself; the only objections, arising being on the question clauses. The point at issue between the Company and the Glasgow Corporation was with reference to the area of supply; and the County Councils were asking for protection which was embodied in a clause that they were anxious to get into the Order as a sort of standard for future applications. So far as the promoters were concerned, they were to a very large extent disposed to leave the decision on the clause to the Board. The Company did not propose to construct any new works. Their plant at present was very much in excess of the requirements of the district, owing to an arrangement come to some years ago with the Glasgow Corporation. This was not an Order requiring the consent of the local authorities, as they already were supplying; but there were minor objections from the parish councils. The Mearns Gas Company were not represented at the inquiry. They had, however, lodged objections to the Order; and to some extent the objections of Glasgow seemed to be associated with those of that body. What Glasgow wanted was to restrict the area proposed by the promoters. By an agreement, Glasgow had bought from the Busby Company about three-quarters of their area; and now the Company were left with works which were adapted for a much larger district than they had to supply. The area the Company were asking to be allowed to supply was similar in size to that which they were at present supplying.

Mr. *W. S. Brown*, the Chairman of the Company, said that before the Company were incorporated in 1888, they had been in existence for some 50 or 60 years. When he took over the undertaking, the price charged for gas was 6s. 8d. per 1000 cubic feet. He immediately reduced it to 5s. 10d.; and the price had been gradually lowered until they were now proposing a standard price of 5s. 5d. Under an old Act of 1857, Glasgow commenced to lay pipes into the Busby Company's district, in order to compete with them. Then the Corporation promoted an annexation Bill, which would have embraced the whole area; but this was withdrawn on account of opposition by different bodies. In 1908, an agreement was come to between the Glasgow Corporation and the Busby Company; and the Corporation took over part of the undertaking at a cost of £9000. The Company parted with this portion of their area really because of the repeated applications to Parliament by the Corporation of Glasgow and the competition in price with them in their own district. In 1909, the Glasgow Corporation promoted another Bill, by which they sought to include in their area part of the district which was being supplied by the Busby Company. The Company petitioned against the Bill; and the House of Commons Committee declined to grant the Corporation the powers asked for unless they purchased the Company's undertaking. The Corporation decided that they would rather retire than purchase,

In cross-examination by Mr. WAKEFORD, witness said that at the time the Glasgow Corporation purchased part of their undertaking for £9000, the capital of the Company was £10,000; but owing to the paying of capital charges out of revenue, it was still worth £10,000. He agreed that when the Corporation proposed their Consolidation Bill in 1910 negotiations were entered into with a view to settling the boundary between them; but the terms suggested by the Corporation were not acceptable.

In reply to Mr. MUNRO, witness said the Company's standard price was at present 4s. 7d., which was equivalent to a dividend of 7½ per cent. They did not really mean that the price charged was 5s. 5d.; but they had taken this amount in order to provide for eventualities. With regard to the 4s. 7d., the Company did not charge meter-rents; so that the price was much more favourable to the consumers than it appeared. If any of the area in dispute between the Company and the Glasgow Corporation were eliminated, his opinion was that the Company would have to withdraw the Order. The only immediate prospect they had of an increase in supply was in the area of which the Glasgow Corporation wished to deprive them. He accepted the clause submitted by the County Council as to inspection by the county authorities, subject to the approval of the Board of Trade.

In reply to Mr. MACDONALD, witness said he did not see any great hardship in reducing the standard price of 5s. 5d. to 5s.

Mr. WAKEFORD, on behalf of the Glasgow Corporation, said that when the Corporation promoted their Bill in 1910 negotiations took place with the Company, resulting, he contended, in what was practically an agreement with regard to the boundary of the two concerns. The Company, however, stipulated that the costs should be paid before the line of demarcation was accepted; and the negotiations fell through. But the parties came together again; and it had been the desire of the Corporation throughout to deal fairly and reasonably with the Company. The Corporation claimed that they were entitled to supply outside their area with the consent of the County Councils.

Mr. *Alex. Wilson*, the Gas Engineer to the Glasgow Corporation, said that last year the House of Lords put upon them an area in the parish of Netherton which they now found they were unable wholly to supply, because they had no satisfactory means of access to the estate. If the Corporation had not been granted power to supply gas in the parish of Mearns—if the House of Lords had not put it upon them—they would not have had any interest in the present application. What Glasgow desired was some opportunity of having a space left outside the Netherton Estate, so as to enable them effectively to carry out the decision of the House of Lords.

Mr. KENNEDY submitted that it would be very unfair to the Company for the Glasgow Corporation to go to Parliament and take advantage of the fact that they had been compelled by the threat of Glasgow to sell their undertaking. For a small concern like the Busby Company to be continually in opposition in Parliament, opposing unreasonable demands of big authorities, was a very heavy drain on their undertaking, and prevented them from reducing the price of gas. Comparing their district with other areas in Scotland similarly situated, it would be found that 4s. 7d. was a very reasonable charge.

Mr. MUNRO intimated that an agreement had been arrived at with the County Councils, and clauses framed with reference to certain minor details.

At the conclusion of the proceedings,

Mr. MACDONALD intimated that he would make his report to the Board on the matter.

POSITION AND PROSPECTS OF COALITE.

The Ordinary General Meeting of Coalite, Limited, was held last Thursday, at Salisbury House, London Wall, E.C.—Mr. A. M. H. WALROND (the Chairman) presiding.

The SECRETARY (Mr. H. J. Almond) having read the notice convening the meeting and the Auditors' report,

The CHAIRMAN explained at some length the various items in the balance-sheet which had been sent to the shareholders, and said the net result was an excess of expenditure over revenue of £6265, after the writing-off of certain large sums which he had specified. This amount, added to the debit balance, made a total of £13,272 to be carried forward. He said he naturally could not ask the shareholders to regard this as satisfactory; but if they took everything into consideration, and compared the position now with that at the end of 1909, he thought they could only come to one conclusion. Then they had a debt owing to the British Coalite Company of more than £170,000; they had not been credited with their full number of deferred shares; and the British Coalite Company held a mortgage over all their foreign patents. This had now been wiped out; and beyond the comparatively small amount of £5964 which was owing, and which they meant to pay off as soon as possible, they were perfectly free. Passing from finances to matters of general interest, the first thing the present Board had to do was to cut down unnecessary expense; and they were able to make an arrangement which entailed moving the offices, but by it they could dispense with the services of all their staff. Turning to the short statement by Mr. Herman Clarke, the Managing-Director of the British Coalite Company [see *ante*, p. 51], the Chairman said he thought he had indicated what had been done to place the affairs of that Company on a businesslike footing. Since Mr. Clarke had been in charge, the whole state of affairs had altered. He had most wisely allowed a highly technical gentleman—a well-known coke-oven manager, who had a large experience of gas-works practice—to help him, with the result that they had satisfied themselves, and also demonstrated to the Directors, that, under proper management, the coalite process was of considerable commercial value. He had gone with the two gentlemen referred to into the results which were being obtained in the new clay retort battery at Barking—results which had been carefully checked by both of them during the past five months; and he had made certain comparisons between their process and the coke-oven process. They both carbonized coal; but the coke-ovens produced a hard coke, to be used principally for smelting purposes, whereas coalite was a softer and much more volatile fuel, absolutely smokeless, which was suitable for household grates, kitchens, and furnaces, and was certainly, as he knew from his own experience, more economical to burn than coal. In this product the Company certainly held the advantage. In regard to tar, by their process they got twice as much from a ton of coal as by the coke-oven process, and the tar was far more oily and more valuable. In this product, they did not suffer by comparison. In sulphate of ammonia, they got slightly less in value; but the difference did not amount to 1d. per ton of coal carbonized. Their gas was less in volume, but of far greater calorific value, than coke-oven gas. There was at present the same difficulty with both processes in getting rid of the gas profitably; but this would without doubt be overcome. As to the cost of carbonizing a ton of coal under the two systems, the coke-oven people might be able to use a slightly cheaper coal; but the actual costs were much about the same in each case. With these results, was there any reason why the Company's process should not earn as good money as the other? His answer to this question was: Under capable and businesslike management, such as he believed the British Coalite Company now had, they ought to be able to do even better than coke-oven plants; and as their spheres of action were quite different, they would not in any way clash with them. He did not wish shareholders to go away thinking all difficulties had been overcome, because they had not; and he did not intend to prophesy large profits or the payment of large dividends in the immediate future. But he did say, and all his colleagues agreed to his stating, that they had, as business men, gone into the position of the coalite process to the best of their ability; and they would not have undertaken the positions they had done if they did not themselves believe that the process, in spite of all that had happened, would win in the end. It was his conviction that the British Coalite Company would be in a position to state that they had proved that the process could be profitably carried on. He strongly urged the proprietors not to part with any of their shares, and concluded by moving the adoption of the report and accounts.

Mr. CECIL BROWN seconded the motion.

A SHAREHOLDER inquired if any arrangements had been made by the Board for the disposal of the gas resulting from the process.

The CHAIRMAN said the Company was not a manufacturing one;

and therefore the question should be put to the British Coalite Company. He did not, however, think there was the slightest doubt that arrangements would be made for the disposal of the gas as soon as it was produced in large quantities.

The motion was carried unanimously.

On the motion of Mr. CAMPBELL, seconded by Mr. ANGEL, the Directors (all of whom retired) were unanimously re-elected. It was mentioned in the course of the Chairman's speech that the Board did not intend to draw any fees until the affairs of the Company were on a different footing.

The CHAIRMAN, in expressing the thanks of the Board for the confidence placed in them, said their interests were entirely identical with those of the shareholders, and if they could do anything to pull the affair through, they intended to do it. The next business was the re-election of the Auditors (Messrs. E. Layton, Bennett, and Co.). He had persuaded them to fall into line with the rest of them; and they had consented to reduce their fees from 100 to 25 guineas.

The Auditors were re-elected at the lower fees,

LOUGHBOROUGH PUBLIC LIGHTING.

Proposed Change from Gas to Electricity Rejected.

At the Monthly Meeting of the Loughborough Town Council on Monday last week, the minutes presented by the General Purposes Committee contained a record of a decision against a recommendation of the Highway Committee to change the public street lighting of the town from gas to electricity. The motion for the confirmation of the minutes gave rise to some discussion.

Alderman CLIFFORD moved, as an amendment, that the paragraph recording the decision be rejected, and that the Highway Committee's recommendation should stand. He explained that, on the amendment against the change, the voting was equal; and the original proposition for the change was lost by only one vote—six against seven. This was very close voting; and as several members were absent, he moved his amendment with the intention of testing the feeling of the whole Council. He would remind them that this matter had been before them for twelve months. The Highway Committee recommended the change, and then the question arose as to the cost; and the General Purposes Committee appointed a Special Committee to go thoroughly into the matter. The Committee reported; and the question was adjourned for further consideration. When it came up again, the decision to which he had referred was come to. Some remarks had been made as to competition; and on this his view was that it was good alike for the Gas and the Electricity Departments. Both being under one Committee, there was not, perhaps, the keen rivalry that would otherwise occur; but all the profits went into one pocket eventually. He had made some inquiries, and found that several towns had changed from gas to electricity, and that some 1700 lamps had been converted in different towns. During the past twelve months, 64 tradesmen and residents in Loughborough had given up gas for electricity—showing that they appreciated the electric light. The figures had been thoroughly gone into by the Committee and the Council, and there would certainly be a saving if the change was adopted. He submitted that, on the whole of the facts before them, the decision of the General Purposes Committee ought not to be confirmed.

Mr. WOOTTON seconded the amendment.

Mr. J. CARTWRIGHT supported the decision of the General Purposes Committee, and was still of opinion that the alteration was not desirable. The whole of the arguments in favour of the amendment had been thoroughly considered and thrashed out during the last twelve months; and the figures had been varied over and over again. Even at the last meeting, it was admitted that some adjustment was still required. He opposed the amendment on the ground that they already had gas-works for which they were still paying, and which were not being worked up to their full capacity. The gas undertaking had become a paying concern, and now it was suggested that they should take revenue from it, which had handed over large sums to the rates, and transfer it to the Electricity Department, which was continually appealing for help. To his mind, the step could not be justified.

Mr. CLEMERSON supported the amendment. He said that if the change were adopted, they would get more light and a much better appearance in their lamps, and also effect a saving of from £70 to £80 a year of the ratepayers' money. It did not matter which pocket the money went into—gas or electricity—so long as there was a saving of money to the town and an improved result.

Mr. COOKE, in supporting the minutes, urged that it could not be said with certainty that electricity would cost less than gas. With regard to competition between the two departments, he agreed that competition was fair when it was free, but when they cut off from one department in order to increase another, he did not consider it was fair.

Mr. DICKENS said that as a user of both gas and electricity, he found gas the cheaper; and therefore he should support gas.

Mr. W. CARTWRIGHT did not think it advisable to pull down gas in order to build up electricity. If the workers of the town were to get any advantage, they must increase, not decrease, the output of gas.

Mr. BARROW supported the amendment, believing that they ought not to tie the hands of the Highway Committee, who had charge of the lighting of the town. If the Committee were satisfied that they could save money and have an improved light, he thought the Council ought not to dictate to them.

Mr. BEARDSLEY said they knew where they were with regard to gas, but not with electricity. His experience was that the cost of electricity was considerably more than that of gas. The results of inquiries he had made were all against the change; and in not a single case had he heard an opinion to the contrary. Under these circumstances, he should support the General Purposes Committee.

On the amendment being put, it was supported by ten and opposed by eleven members of the Council. It was consequently declared lost. The motion to confirm the minutes was then put and agreed to.

OUTSIDE SHOP LIGHTING IN BERMONDSEY.

The Bermondsey Borough Council last Tuesday evening considered a report of the Electricity and Street Lighting Committee, in which it was stated that the Engineer had attended a meeting of shopkeepers in Southwark Park Road to discuss the question of outside lighting, on the lines of the installation in the Lewisham High Road, Catford, and elsewhere. The South Metropolitan Gas Company and the Metropolitan Electric Light Company were prepared to supply and fix outside lamps and maintain them for a fixed sum per post per annum. The shopkeepers required from 20 to 25 lamps along the pavement of Southwark Park Road; and the Engineer suggested that the Council should provide them at £5 10s. each per annum. The cost of 20 arc lamps, &c., would be £265; while the annual income from them, at £5 10s. each, would be £110. The annual cost of carbons and maintenance was estimated at £25 10s., and the maximum number of units to be consumed—7020 per annum—at 2d. per unit, meant £58 6s. 8d. There would thus be a balance of £26 3s. 6d. per annum for interest on, and replacement of, capital. The Committee recommended that the outside lamps should be provided as suggested; and that they should be empowered to carry out the undertaking.

Mr. W. Hood said he was always given to understand that the cause of the electric lighting in Southwark Park Road being so bad was the mains. Would the additional lamps make the light worse? Mr. J. Fogden proposed that the Council should take no action in the matter. He said he failed to see why they should spend £265 on erecting the lamps—a pure speculation—when there was a Gas Company and also an Electric Light Company in the same area ready to supply the shopkeepers. He did not think the lamps would be kept in repair for £5 10s. a year. Mr. D. Williams and Mr. J. R. Martin thought that the Council should give the shopkeepers every encouragement. Colonel Bevington said the shopkeepers would get their light from the Gas or the Electric Light Company, and if they did so they would benefit the Council's electric light undertaking, for the more they extended it, the more money they lost. It was already overburdened; and they had lately been called upon to lay out £25,000 on extending the plant. Alderman Harbord, the Chairman of the Committee, in answer to Mr. Hood, said they had strengthened the mains in Southwark Park Road, and there would be no difficulty in supplying a good light. The electricity undertaking was a paying concern, for they yearly repaid large sums in interest and capital, which a private company would allocate to profits and dividends.

The Committee's recommendation to proceed with the work was agreed to.

BUCKS AND OXON DISTRICT GAS COMPANY.

The Official Receiver's Report.

The following particulars have been taken from the report of the Official Receiver (Mr. H. E. Burgess) on the affairs of the Bucks and Oxon District Gas and Coke Company, Limited. The winding-up order was made last October.

The Company was formed in May, 1907, with a nominal capital of £25,000, to carry on the business of manufacturing and supplying gas, and of coal and coke merchants. The nominal promoters were the Finance and Construction Company, Limited; the actual promoter being Mr. E. O. Preston (trading as Preston and Co.), who held the controlling interest in the Finance Company. The scheme which the Company was formed to carry out was to acquire gas-works (under construction by the Finance Company) at Adderbury, Bucks, and to supply therefrom, when completed, that and adjacent towns with gas; and, in doing so, to materially reduce the charge for gas, and introduce slot-meters and cookers. The Company were also to acquire gas-works at Buckingham, Cricklade, and Woodford (Northampton).

The total consideration payable under the purchase contracts amounted to £61,500, of which £41,175 was payable in debentures and £20,325 in preference shares. Of these, £37,500 in debentures and £8250 in preference shares had been issued and allotted; leaving an undischarged balance of £15,570. The debentures issued in part payment for the various undertakings were disposed of by Preston and Co., the Finance Company, and others, for cash—in many instances at a discount of from 10 to 30 per cent. In some cases, the guarantee of Mr. Preston was given in respect of principal and interest. About £3000 of the preference stock was disposed of in the same way. The proceeds of the sale of these securities were received by Preston and Co. and the Finance Company. Mr. Preston has stated that the cash expenditure upon the various properties, together with advances made to the Company and legal and other expenses, amounted to about the total cash realized from the sale of the debentures, and that the Finance Company looked only to the fully paid-up shares for their profit. The Company was registered with a declaration that there was no intention to invite the public to subscribe for shares. A prospectus dated June, 1907, offering 10 preference shares of £10 each for subscription, was registered with the Registrar of Joint-Stock Companies, for the purpose, it is stated, of complying with the requirements of the Companies Act to obtain the Registrar's certificate to commence business. By the amendment of the articles in June, 1908, the Company was constituted a private company. The intention as regards working capital was, it is stated, to obtain subscriptions privately to the preference capital. The total cash subscription to these shares has, however, amounted to only £350 from the Directors and the signatories; and this amount has constituted the entire working capital of the Company, which was in want of funds throughout. The Company have been financed by Mr. Preston and the Finance Company; and when the latter Company liquidated in 1909, and Preston and Co. were unable to assist them further, the Bucks and Oxon Company went into voluntary liquidation, in June, 1910. Default was made in payment of debenture interest; and on July 1, 1910, a Receiver was appointed for the debenture

holders. He is still in possession of the various undertakings, and is carrying on the business.

The failure and insolvency of the Company are attributed by the officials to want of working capital, to the capital being too heavy having regard to the present revenue, and to attacks made upon the Company's credit by outside persons, which caused the debentures and shares to become unsaleable—thus preventing those financing the Company from raising funds. The accounts filed under the liquidation show assets valued at £49,222, subject in the first instance to loans on debenture bonds £38,738 and preference claims £87—thus leaving a balance of £10,396 available for the unsecured creditors, whose claims are returned at £21,249. The account with regard to the contributories discloses a deficiency of £19,453. The assets have been valued by the Directors on the basis of a sale as a going concern; but from a valuation which the Receiver has had made, it appears that they will not realize anything like the Directors' estimate.

STREET LIGHTING STATISTICS.

Mr. H. Tomlinson-Lee, the Electrical Engineer of the Wimbledon Electricity Department, has compiled the accompanying table of statistics relating to street lighting by electricity and gas. A comment upon them, pointing out some of the lessons of the figures that have been missed by our electrical friends, appears in the "Electricity Supply Memoranda" to-day, p. 95.

Town or Borough.	Miles of Streets Lighted.	No. of Lamp Posts.			Candle Power.			Cost per Annum, including Renewals, Repairs, and Attendance.		Total Cost per Mile per Annum.	Total Cost per Candle Power per Annum.		Approx. Lighting Rate per £ per Ann.	Total Cost per C.P. per Mile per Ann.
		Arcs.	Incandescent Elec.	Gas.	Electric.	Gas.	Total per Mile.	Electricity.	Gas.		Elec.	Gas.		
								£	£	£	d.	d.	d.	d.
Bournemouth	104½	157	..	2350	160,000	188,000	3,338	2,549·2(h)	5,884·8	80·90	3·82(h)	7·51	3·11	5·81
Blackpool	70	272	775	2270 (c)	190,000	60,000 (c)	3,571	5,770·0	5,400·0	159·57	7·28	21·60	5·25	10·72
Chelsea	..	..	..	1646	..	255,000	..	..	5,865·0	..	..	5·52	1·50	..
Camberwell	132½	..	..	4555	..	273,180	2,066	..	12,041·0	91·04	..	10·57	2·11	10·57
Deptford	50	..	..	1899	..	120,810	2,416	..	4,766·4	95·32	..	9·46	1·81	9·47
Ealing	53½	72	817	870	256,850	52,790	5,815	4,498·0(i)	2,046·6	122·91	4·20(i)	9·39	3·50	5·07
Eastbourne	48	97	16	1400	146,300	70,000	4,506	2,020·0	4,646·0	138·92	3·31	15·93	3·74	7·39
Finsbury	37	..	..	1861 (d)	..	240,000(d)	6,486	..	6,950·0	187·84	..	6·95	1·60	6·95
Fulham	62	226	914	1025	407,550	41,000	7,235	7,921·0	3,695·9	200·56(p)	4·66	21·63	3·26	6·65(p)
Gloucester	45	175	10	1200	100,000	80,000	4,000	2,247·0	3,267·0	122·53	5·39	9·80	5·67	7·35
Hammersmith	57	254	521	902	145,300	44,022	3,321	5,642·0	3,042·0	152·35	9·32	16·58	2·39	11·01
Hampstead	62½	136	1021	1501	324,480	..	5,212(f)	5,496·0	5,073·0	169·78	4·07	..	2·27	..
Holborn	25⅔	..	..	1924	..	185,000	7,184	..	7,102·0	275·80	..	9·21	1·59	9·21
Harrogate	60 (17⅝) (a)	1	700	1520	38,400	not given	2,200(f)	752·8	1,292·0(n)	34·08(q)	4·70	..	1·84	..
Islington	124	615	32	4125	1,167,936	190,044	10,951	15,225·0	13,112·0	228·52	3·13	16·56	3·50	5·01
Kingston	29½	81	291	481	56,900	29,505	2,929	1,946·3	2,369·5	146·30	8·21	19·27	4·42	11·98
Lambeth	153	25 (b)	..	5155	12,500	298,000	2,029	..(k)	13,000·0	84·96	..	10·47	1·60	10·05
Lewisham	132	..	..	3305	..	127,835	968	..	7,920·0	60·00	..	14·87	1·74	14·87
Leyton	66½	98	1558	..	273,900	..	4,119	8,642·0	..	129·95	7·57	..	4·05	7·57
Paddington	60	..	..	4011	..	245,000	4,083	..	11,650·0	194·16	..	11·41	1·95	11·41
Poplar	62½	342	571	895	208,892	35,625	3,912	9,053·6	2,638·2	187·07	10·40	17·77	3·36	11·47
Portsmouth	137	420	486	1924	728,600	not given	5,318(f)	7,113·0	6,078·0	96·28	2·34	..	2·97	..
St. Marylebone	62	87	3500	..	405,000	..	6,532	..(l)	..(l)	..	..	..	..	..
St. Pancras	90	947	70	1623	997,500 (e)	97,380 (e)	12,165 (e)	15,918·0	5,320·0	235·98	3·83(e)	13·11(e)	2·83	4·65(e)
Southwark	65	108	158	2368	339,800	333,240	10,354	3,609·8	7,964·3	193·45	2·55	5·73	2·12	4·48
Surbiton	26½	..	2	681	c.p. not given		..	6·5	2,300·0	87·06	..	..	2·96	..
Wandsworth	208½	5	..	6147	5,000 (e)	553,230 (e)	2,677 (e)	25·6	18,137·7	87·11	1·23(e)	7·88(e)	2·04	7·81(e)
Westminster	99	1080	183	2903	..	..	..	24,236·4	13,108·5	377·22	..	..	1·40	..
Woolwich	78	153	263	1714	285,000	78,000	4,654	3,742·6	3,978·5	99·00	3·15	12·24	2·28	5·10
Wood Green	30½	..	..	1090	..	86,000	2,838	..	3,044·0	100·46	..	8·49	2·92	8·49
Wimbledon	45⅝	91	1136	..	313,500	..	6,839	6,645·2	..	144·96(r)	5·08	..	3·78	5·08(r)
					Average		4,892(g)	£7,001·5(m)	£6,681·5(o)	£151·78	4·96	12·25	2·78	8·26

(a) Mileage of streets electrically lighted only. (b) Arc lamps lighted free under agreement. (c) and (d) All of these are inverted burners. (e) Candle power estimated. (f) Electric only, gas candle power not given. (g) Exclusive of Hampstead and Portsmouth. (h) Cost of electricity includes £1100 interest and sinking fund charges. Cost of electricity includes £304 for new flame lamps and £258 16s. for arc-lowering and fixing gear. (i) On 17⅞ miles of streets. (k) Electric lamps free. (l) Cost not available for complete year. (m) Exclusive of Surbiton and Wandsworth. (n) Cost of gas is exclusive of labour. (o) Exclusive of Harrogate. (p) Total cost includes loan charges and alterations to lighting. (q) Total cost per mile on 60 miles of streets. (r) Total cost includes loan and interest charges.

ASSOCIATION OF MUNICIPAL CORPORATIONS.

Annual Meeting in London.

The Guildhall Council Chamber was crowded on Wednesday, the 22nd ult., with representatives from both county and non-county boroughs at the time appointed for the opening of the annual meeting of the Association of Municipal Corporations. As is customary on these occasions, the chair was taken at the commencement of the proceedings by the Lord Mayor of London (Sir Thomas Vezey Strong), who subsequently gave place to Mr. J. Harmood Banner, M.P., of the Liverpool Corporation, who has for some years past occupied the position of President, and is now Vice-President and Chairman of the Association.

The Ratepayers' Burden—Municipal Trading.

The Lord Mayor, in welcoming the Association to the Guildhall, said he thought that, on the whole, the greatest advantage they could work for in connection with municipal affairs was, while maintaining the highest degree of efficiency, to secure greater economy. He ventured to express the opinion that local self-government was on its trial; and great as the advantage of local self-government had been, and was likely yet to be, to their countrymen, even this gain might be purchased at too high a price. Among the other matters for the deliberation of the Association that day, he would submit, with great respect, that it would not be wholly disadvantageous to the public interest if, as the result of the meeting, it was determined that each representative, on returning to his own authority, should move for the appointment of a committee charged with the responsibility of investigating and considering whether, in the case of their own respective authorities, greater economy could not be established. He thought a further point worthy of consideration was how far they were warranted in continuing to pursue the great question of municipal trading, and whether it would not be worth their while to stop to inquire if the results that had been achieved by past efforts in this direction really warranted their pursuing these subjects further. Then another matter which seemed to him worthy of the contemplation of the representatives of the local authorities might well be that huge sum which represented the loans raised for local purposes—reaching, as it did, in the aggregate an amount something like approximate to the National Debt of the country. These appeared to him to be questions on which one could not, of course, without careful study form any definite judgment; but they were subjects of such vast importance to the population at large, that they were well worthy of the consideration of the most experienced men in the public service. In his own part of the world, at least, they were approaching the time when the local burdens, superadded to the liability for Imperial expenditure, would amount to such a total sum as to render commercial enterprise with any prospect of a profit extremely difficult, and in many cases impossible; and so, for the want of any other subject on which to base these few introductory remarks, he ventured to submit the points he had named for the consideration of the members of the Association, and to ask them (if they appealed to them as being worthy of their attention) whether they would not all be consulting that greater advantage of the public for which they were working, and which alone justified their existence, by reducing somewhat where possible these gigantic burdens, while at the same time insisting upon the maintenance of the highest standard of efficiency.

President and Vice-Presidents.

The Lord Mayor proposed the election of the Earl of Derby as President of the Association for the ensuing year.

The Lord Mayor of York seconded the proposition, which was at once unanimously agreed to.

The Lord Mayor next proposed a vote of thanks to Mr. Harmood Banner for his valuable services as President during the past year, and that he be elected a Vice-President of the Association and Chairman of the Council for the ensuing year.

The Lord Mayor of Manchester seconded this, and it also was unanimously passed.

The Chairman, in returning thanks, remarked that all the municipalities of England and Wales, with one exception, were represented in the Association; and as he claimed that the municipalities worked

together for the common good, it followed that those assembled at this meeting were there for the same purpose. The Association had Committees always sitting; and there was not a Bill affecting the municipalities or their requirements which they did not deal with and watch. There were represented in the Association 296 towns; and as behind these were the same number of Clerks, it was easy to guess what criticism all Bills affecting municipalities received. The Lord Mayor had spoken of economy; and he could assure him there was no principle so dear as this to the Association, and there was no direction in which they were striving so hard to attain advantages for their ratepayers. They had had greatly in their minds the astonishing fact that, while they exercised the strictest and greatest economy in their own expenditure, they had no power to reduce, to relieve, or to get rid of the heavy Imperial expenditure which was from time to time imposed upon them.

A vote of thanks having been accorded to the late Vice-President (Mr. A. H. Scott), it was agreed to alter the rules so as to allow of the election of a number of Vice-Presidents, instead of one as formerly. The following gentlemen were then unanimously elected as additional Vice-Presidents: Lord Rotherham, Mr. G. R. Thorne, M.P., Mr. W. Middlebrook, M.P., Mr. Hamar Greenwood, M.P., Lord A. G. Thynne, M.P., and Sir W. J. Bull, M.P.

Local and Imperial Finance.—Audit of Accounts.—Bankers' Overdrafts.

The Chairman, in the course of a short address, touched upon a number of matters of interest to the Association. The first and most important of these, he remarked, was the question of local and Imperial finance. Facts were stubborn things; and when they could show—as they could by their municipal records—that Parliament had entrusted municipal councils with certain work to do, which had imposed upon them an increased expenditure of 89 per cent., while the State had failed to give any adequate grants except to the extent of about 20 per cent. (and this apart from added charges for education), then undoubtedly the municipalities were suffering under a grievance. The grants in aid and the expense of work entrusted to the municipalities ought to have progressed on some fair proportionate lines; and the difference between 89 per cent. and 20 per cent. could not be considered other than an anomaly. A Special Committee had been appointed to report upon the question of municipal trading; but they confined their report to the audit of local authorities' accounts. They went very fully into the subject of the audit of municipal accounts; and in their report they condemned the system of audit by district auditors, and recommended the application to the local authorities of a new system of audit, under which the auditors would be qualified accountants, whose tenure would be rendered secure by a provision that they should not be dismissed without the consent of the Local Government Board, and who would, of course, be properly remunerated—the amount of the remuneration to be determined by the Board in case of difference. Wide powers would be conferred upon the auditors; and under the system so proposed, there could be no doubt an efficient audit would be provided for. The municipalities had never objected to an efficient form of audit, and had repeatedly requested the Government to initiate legislation on the lines recommended by the Joint Committee. The views of the Association on this subject were shared not only by the several bodies representing professional accountants, but also by the Association of Chambers of Commerce of the United Kingdom. In the course of last summer, a decision was given in the Chancery Division in an action brought by the Attorney General against the West Ham Corporation, with reference to the use by the Corporation, for the purposes of their trading undertakings, of money derived by means of an overdraft at the bank. So far as the actual case was concerned, it did not appear that any new points had been decided; but the action had undoubtedly given rise to further consideration of this somewhat difficult subject. There appeared to be no precise decision upon the question whether, where a corporation were carrying on a trading undertaking producing a revenue, they might not adopt the ordinary method of making use of their banker for the purpose of defraying expenses which were necessarily incurred before the revenue was actually received; and an opinion which the Law Committee had obtained seemed to show that this would be a lawful exercise by the corporation of the powers entrusted to them by Parliament. Undoubtedly, however, it was very desirable that this matter should be placed upon a definite basis; and the Law Committee had accordingly approached the Local Government Board upon the subject, with a view, if possible, to obtaining amending legislation.

The Question of a Municipal Income-Tax.

Several resolutions on the subject of grants in aid of local taxation (one calling on the Government to initiate legislation, and another asking for immediate relief) and the land value duties having been passed,

The Lord Mayor of Bradford moved that a Committee be appointed to investigate and report next year as to whether the basis of assessment for local rating should be altered so that, instead of such assessment being fixed on the value of hereditaments and premises, it should be fixed on incomes according to a sliding-scale of percentages having regard to the amount of the income received by the individual; and whether it would be advisable to urge the Government to introduce legislation to give effect to this principle. He pointed out that, briefly put, the suggestion he wished to make was that, for purposes of local taxation, incomes, and not rents, should be the basis for assessment. The need for increased revenue to meet local requirements was an urgent one; and at present the burden was falling largely on those least able to bear it—improvements of every kind being delayed or inadequately carried out on this account. It was becoming increasingly difficult to secure payments from Imperial sources for local work; and it therefore behoved them to find out the best and fairest way to secure increased revenue locally. He believed it was generally acknowledged that the income-tax was the most equitable tax; the burden falling in proportion to the means to meet it. Rent was no criterion of profit or income. A professional man and a great number of business men with two or three rooms might have a much larger return with a comparatively small rental compared to shopkeepers, many of whom made a very small profit in consequence of high rents paid, and correspondingly high rates. The system of valuation was also such that high rents, and accordingly rates, were erratic and fluctuating, depending on various influences. Income, on the contrary, gave a definite basis on which to assess. He found that where this system prevailed it worked most satisfactorily. The methods were simple and equitable, and both time and money were saved.

The Mayor of Halifax, in supporting the proposition, remarked that the underlying principle of all rating should be ability to pay; but that was not the basis on which local rates were levied in this country. In Germany, there was a municipal income-tax, which was really rating people according to their ability to contribute.

On being put to the meeting, however, the resolution was declared to be lost.

Before dispersing, the members considered other matters which do not specially call for notice here.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

With an experience extending back to 1892, I can say with certainty that the greatest of all Informal Meetings of Scottish Gas Managers was held in Glasgow on Wednesday. There may have been meetings at which matters of more importance were talked about; but assuredly there has been no meeting at which there was a fuller attendance of gas managers—there were over 100 present—or at which there was a greater volume of discussion. The larger attendance I attribute to the more serious view which is now taken of life in the gas industry. There is opposition to gas undertakings from without, to meet which it behoves everyone in harness to equip himself with all the talents he can acquire, by study and by association. There is also, since the advent of the Junior Gas Associations, a rivalry that did not exist before in the securing of posts, which makes those who are already in harness look to it, if they desire promotion, that they do not fall behind the energetic juniors, and that they do nothing in their lives that would lead to a vacancy being created into which a junior might be put. In other words, the Junior Gas Associations have made gas managers more alert in business and circumspect in their lives than they used to be, which is much to their own advantage and to the benefit of the industry. The changed demeanour of gas managers, in Scotland at least, is most marked. The rollicking spirit of old times is gone, and the meetings are now gatherings of business men for business purposes; and, as a consequence, the vocation stands higher than it ever did. There was so much that was admirable at the meeting on Wednesday, including the address of the President (Mr. J. B. Scott, of Cowdenbeath), that if I were to begin taking note of noteworthy points, I am afraid that I should get into the position which, of a surety, more than one speaker at the meeting did—of finding it difficult to bring my remarks to a close. I ask permission for no more than to make a passing and appreciative reference to two matters. The first is with regard to the President's system of maintenance of fittings, and his instruction of his staff. These two items hang the one upon the other; for if the staff are to be employed in maintenance work, they must do it intelligently and upon a uniform system, which, in turn, must be the system of the master mind. The subject is worthy of more than passing consideration. I desire, in the next place, to commend the President for his energetic endeavour to expiscate the subject of purifier area. I suppose he has not, even with the aid of the numerous speakers at the meeting, succeeded in helping towards a solution of the problem, because the conditions are so diversified; but his calling attention to the difficulties which there are in the way of discovering or applying any satisfactory rule upon the subject, will be sufficient reason for managers applying their minds to the purifier provision they require, instead of blindly accepting and following the rule of any of the authorities—a rule which may have been laid down and be suitable for a situation altogether different from theirs. The President has at least opened the eyes of his brethren to the chaotic state in which an important branch of their business is being carried on; and to this extent he has done good service. The conviction must be borne home to all that the Informal Meeting is year by year more clearly justifying its existence.

In the Glasgow Town Council on Thursday, it was reported, in a minute of the Gas Committee, that the Committee had adhered to their former resolution to subscribe £525 to the fund of the Institution of Gas Engineers (Publicity and Special Purposes Committee) for the purpose of bringing the advantages and utilities of gas more prominently before the public, on the understanding that a fair proportion of the money subscribed be used in advertising locally. Mr. Irwin moved disapproval of the minute. He said that no reasons could be brought forward now in support of the proposal which were not submitted when the matter was before the Corporation on the 2nd of March. The recommendation was adopted by a large majority.

As a following-up of the remarks last week regarding the cost of the Kirkcaldy gas arbitration, I may mention that on Tuesday and Wednesday of this week the annual meeting of the Convention of Burghs in Scotland was held in Edinburgh, at which Mr. Munro Ferguson, M.P., who is Provost of Kirkcaldy, moved—"That arbitrations for ascertainment of value of property in Scotland, acquired in virtue of statutory powers, should be conducted in Scotland, and that evidence be taken, so far as possible, from beginning to end *de die in diem;* that the proceedings be before a single referee appointed by judicial authority; and that discretion as to costs be vested in the referee." In merely ascertaining the value of property at present, he said, a municipality might be dragged off to London, and be kept there at great expense for several days. Did anyone suggest, he asked, that there was not in Scotland talent of every kind to conduct arbitrations? Instances were given by other speakers of the enormous expenses incurred in arbitrations; and the subject was eventually remitted to the Annual Committee of the Convention, for consideration.

The effect which the proposed legislation with reference to Dundee Harbour, to which I referred last week, will have upon the gas-works service does not really seem to be understood. There was a meeting

of the Harbour Board on Monday, at which several questions were asked of the promoters of the measure, one of which, by Bailie Paton, related to the carriage of coal to the gas-works. They had been told, he said, that coal would not be conveyed to the gas-works by the Railway Companies; but since then an official and inspired statement was sent from the Harbour Office to the Press, stating that this was not so. Was it not the case that coal shipped to the port of Dundee could be blockaded unless some arrangement were made with the Railway Companies? Mr. Leitch replied that the Town Council would have to arrange rates with the Railway Companies. If such rates were not mutually arranged, he supposed the Railway Companies would refuse to do anything. Mr. T. B. Taylor pointed out that the Bill said that everything would be lifted at the Harbour. The arrangement of rates was a matter for the consignees; and if they had any fault to find with the Railway Companies' procedure, they could appeal to the Board of Trade. The Companies were bound to lift the traffic. Bailie Paton said that this answer was in direct opposition to that of Mr. Leitch, and that they seemed to be opening the way for litigation. There is not, in truth, much enlightenment in all this; and it does look as if the rights of the parties will require to be determined judicially.

The Gourock Town Council on Tuesday presented to Sheriff Principal Kennedy at Greenock a petition for authority to erect a gasholder in Royal Street. Objections having been intimated, the Sheriff ordered the Town Council to lodge within seven days a condescendence containing particulars regarding the proposed holder and the necessity for it, and the objectors to lodge answers to the condescendence within other seven days. It was arranged that an inquiry into the matter should be held before the Sheriff between May 25 and June 5. This is not the first occasion upon which the Sheriff of Renfrewshire has required to hold an inquiry into the erection of a gasholder at Gourock, the late Sheriff Sir John Cheyne having held an inquiry in 1895 [see "JOURNAL" for April 9 of that year]. On that occasion, the Sheriff gave his consent. There has been, I believe, only one other such inquiry, that which was held by Sheriff Wilson at Elgin, on an application by the Corporation of Elgin [see "JOURNAL" for Oct. 8, 1907]; and in that case also the Sheriff gave his consent.

There is at the present time competition for the lighting of Gullane. On Monday, at a meeting of the Western District Committee for the county, there was under consideration a proposal by Messrs. Crompton and Co. for the introduction of the electric light into the place. Permission was also sought by the promoters of a gas undertaking to lay gas-mains in the public road between Luffness and Gullane. This was granted; while the proposal for the introduction of electric lighting was referred to a Sub-Committee. The gas supply is to be obtained from existing gas-works at Aberlady, to carry on which there is a movement for the formation of a new Company.

The Edinburgh and District Water Trust have had before them this week reports from Professor J. Walker, of the Edinburgh University, and other experts, regarding the alleged impurities which have been found in the water supply. The Trustees have appointed a Sub-Committee to further consult with the experts on the matter.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 129.]

LIVERPOOL, *April* 8.

Sulphate of Ammonia.

There has been some improvement in the demand for shipment abroad; but the requirements for consumption in the United Kingdom continue on rather a small scale. Throughout the week the supply has been ample to meet all inquiry, and a still further decline in values has to be recorded; the quotations at the close being £13 13s. 9d. per ton f.o.b. Hull, £13 15s. per ton f.o.b. Liverpool, and £13 17s. 6d. per ton f.o.b. Leith. In the forward position, little interest is now being shown; but it is reported that early in the week £13 10s. per ton f.o.b. Liverpool was paid for equal monthly quantities over the last six months of this year.

Nitrate of Soda.

The market for this commodity has again become somewhat firmer, and the spot quotations have been advanced to 9s. 9d. per cwt. for ordinary and 10s. for refined quality.

LONDON, *April* 10.

Tar Products.

The markets for tar products have remained fairly steady during the past week. In pitch, the market has a slightly firmer tendency, and there has been an improvement at one or two ports. Crude carbolic acid has shown signs of weakening; and it is reported that lower prices have been accepted in one or two places for the present year's delivery. Benzols are weak, and business is hard to transact. Solvent naphtha is steady. Heavy naphtha is in fair demand. Several transactions in creosote are reported at about to-day's market price; but there still appears to be plenty of oil to meet the demand.

The average values during the week were: Tar, 17s. 9d. to 21s. 9d., *ex* works. Pitch, London, 36s. to 36s. 6d.; east coast, 35s. 6d. to 36s.; west coast, Manchester, 35s. 6d. to 36s., Liverpool, 36s. to 36s. 6d., Clyde, 36s. to 36s. 6d. Benzol, 90 per cent., casks included, London, 8¾d. to 9¼d.; North, 8¾d. to 9d.; 50-90 per cent., casks included, London, 9d. to 9¼d.; North, 8¼d. to 9d. Toluol, casks included, London, 9¾d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d.; heavy naphtha, casks included, London, 1s. to 1s. 0½d.; North, 11d. to 11½d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 1⅝d. to 2¼d. Heavy oils, in bulk, 2⅜d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 7d. to 1s. 8d.; west coast, 1s. 6½d. to 1s. 7½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

There has been a further weakening in this market during the past week, and sales are difficult to negotiate. Actual Beckton to-day is

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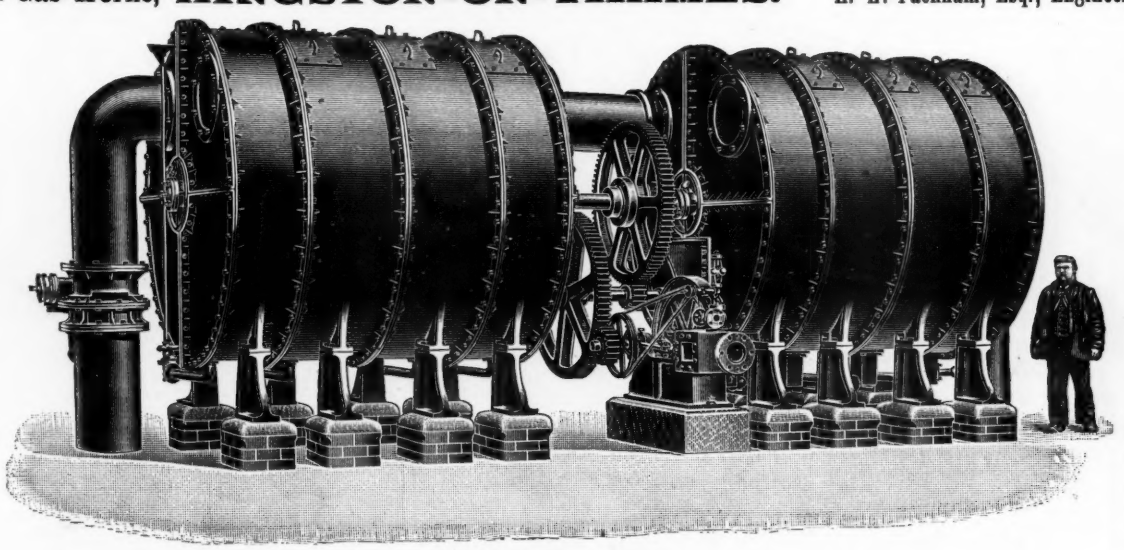

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COAL TRADE REPORTS.

Northern Coal Trade.

The coal trade is a little busier; and there is now a full shipment. In the steam coal trade, the demand for best classes is stronger, and values are a little higher; the opening of the Baltic trade being near at hand. Best Northumbrian steams are from 10s. 9d. to 11s. per ton f.o.b., second class steams are 9s., and steam smalls from 5s. to 6s. 3d. The demand is taking up a fair output; and the collieries seem to be working well. In the gas coal trade, the request is good for this season of the year—the exports being rather heavy. Durham gas coals vary in price from 8s. 6d. to 9s. 6d. per ton f.o.b. for the usual classes; while for "Wear" specials, up to 10s. and at 10s. 6d. per ton f.o.b. are the current quotations. There are not many new contracts now in the market. But there is a disturbing element in the trouble between the coalowners and miners in Durham over the three-shift system of working at the collieries. Though the alarming rumours as to a possible strike are exaggerated, yet it is not easy to see how the difficulty will be ultimately got over; and it will induce some of the coalowners to put off making additional contracts for gas coals. It is fortunate that this difficulty becomes acute at the time when the home consumption of Durham coals is decreasing. Coke is steady. Gas coke is less plentiful—good sorts being from 13s. to 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

The coal market continues quiet. Foreign orders give little indication of improvement. The home demand is fairly good. Small sorts are in request. The prices now quoted are: Ell, 8s. 9d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 3d. to 9s. 6d.; and steam, 8s. 9d. to 9s. 3d. The shipments for the week amounted to 297,325 tons—an increase of 19,805 tons upon the previous week, but a decrease of 67,451 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,600,155 tons—a decrease upon the corresponding period of 113,245 tons.

Liability for Money in Prepayment Meters.—In a case which came before his Honour Judge Austin at the Bristol County Court on Monday last week, the Gas Company sought to recover from two defendants payment for gas they had consumed and the amount of damage done to the meters. Defendants asserted that they had put the money into the meters, but that some unknown persons had broken them open and stolen it. The Judge explained that people who hired meters were liable both for any damage that might be done to them and for the gas they registered; and he accordingly gave judgment for the Company.

Extensions at the Crewkerne Gas-Works.—At a recent meeting of the shareholders of the Crewkerne Gas Company, it was decided that, in view of the increased and growing demand for gas in the town, and the present inadequate storage capacity at the works, the Company should take immediate steps to have erected an additional gasholder, and also a station meter and governor, as recommended by the Manager (Mr. Henry Wilkinson) in his report on the required extensions of the gas plant. In order to provide for this outlay, the capital of the Company has been increased by the creation and issue of preference shares. A contract has been entered into with Messrs. Willey and Co., of Exeter, for the immediate erection of the apparatus needed at the works.

The Inspection of Gas-Fittings.—Owing to an escape of gas from a bracket, a young married couple named Allen, who carried on a grocery and vegetable business in Belfast, were found dead in an upper room in their house last Tuesday. At the inquest on Thursday, the City Coroner (Dr. James Graham) reminded the Jury that gas poisoning cases were mostly due to defective fittings; and therefore he would urge the necessity of the Corporation getting powers to enable them to supervise not only the fixing of the meter, but also the introduction and repair of interior fittings. Houses were vacant for some time, and they were often invaded by boys or men who removed piping and brackets. There was no doubt that if proper fittings had been in the house in the present case, the fatality would not have occurred. Mr. E. P. Cruiks, the complaint inspector of the Gas Department, in answer to the Coroner, said he would recommend that the Corporation should have power to control gas-fittings. The Jury returned a verdict of "Accidental death from coal-gas poisoning," and added a rider to the effect that the Corporation should have power to see that proper gas-fittings are put in all houses, and also that the fittings are kept in good order.

Electric Light Failures.—An extraordinary scene occurred at St. Woolos Church, Newport (Mon.) last Sunday night, when, owing to the sudden failure of the electric light, the building was plunged in darkness. The ordinary evening service was over, and the members of the choir were rendering a sacred cantata to a crowded congregation. Without the slightest warning every light went out and the singing ceased. People stood up, women screamed with alarm, and a few made for the doors. When a serious panic seemed likely, the Vicar (Rev. D. H. Griffiths) entered the pulpit and reassured the congregation by saying that all would be right within a few minutes. The fears of the people were finally allayed by the choir beginning to sing again in the darkness. Meanwhile, the Churchwardens groped their way to the emergency gas-burners, and gradually one by one the lights sprang into brightness. Damage estimated at several thousands of pounds was caused by a fire which occurred in the early hours of last Thursday morning in a studio on the New Forest estate of Lord Montagu of Beaulieu. The studio was used for making maps, and contained much valuable apparatus. An investigation into the cause of a failure of the electric light led to the discovery of the outbreak.

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Saving under the Water Board's Charges Act.—In the annual report of the Borough Engineer of Camberwell (Mr. W. Oxtoby, M.Inst.C.E.), which has lately been issued, it is stated that under the uniform scale of charges for water introduced since the passing of the Metropolitan Water Board (Charges) Act, which came into operation in 1908, the Camberwell Borough Council have, since that date, paid 6d. per 1000 gallons for water for road purposes, and have had the advantage of a reduction in meter-rents; so that, whereas during the preceding seven years the average annual cost was £1529, for the past two years it was £1079 and £934 respectively.

English Coal in Germany.—In the Upper House of the Prussian Diet last Thursday, Count Tiele Winckler, who is one of the largest coalowners in Silesia, raised the question of the competition of English and Silesian coals in Berlin, and pressed the Government to grant railway and other concessions in favour of the home product. The Minister of Public Works (Herr von Breitenbach) said in reply that in this matter the interests of the mines were opposed to those of the shipping trade. At present, the cost of freights to Berlin was about the same for English and Silesian coal. He had accordingly decided, not without reluctance, against the wishes of Silesia. The Minister said the trade in gas coal had fallen off; but, as a whole, the industry had not suffered.

Position of the South Lincolnshire Water Company.—At the meeting of the Spalding Rural District Council on Monday last week, the principal business was a discussion on a communication as to the future of the South Lincolnshire Water Company, whose area includes part of the Council's district, and whose scheme the contractor has recently stated his inability to complete. The Receiver wrote that the undertaking must either be sold to the local authorities and disposed of as a speculation with a view to the formation of another company, or the mains taken up and sold for old iron. The Clerk pointed out that the Council, with the Holbeach and Sutton Bridge Urban District Councils and the Holbeach Rural District Council, could form a Joint Board to buy the undertaking—borrowing money to complete the job. Considerable discussion took place as to the advisability of this step; and ultimately the Clerk was asked to communicate further with the Receiver.

Prevention of Waste of Water.—At the recent annual dinner of the Sheffield Master Plumbers' Association, Mr. W. Terrey, the General Manager of the Sheffield Corporation Water Department, in proposing the toast of the evening, referred to the question of the waste of water, and emphasized the importance of the inspection by the water authorities of plumbing work. He said the value of waste prevention was not fully appreciated. In Sheffield, owing to regular and systematic inspection, the consumption of water per day was among the lowest in the kingdom. If the same quantity of water were consumed in Sheffield as (say) in Glasgow or London, it would involve the construction of three reservoirs, each equal in capacity to the huge one at Langsett, a capital outlay of more than £2,000,000, and an annual expenditure of £100,000—equal to something like 1s. 2d. in the pound on the district rate—simply to provide for what was really preventable waste.

Recovering Cost of Altering Depth of Mains.—At the meeting of the London County Council last Tuesday, the recommendation of the Highways Committee, that the Council should pay the Gaslight and Coke Company the costs they had incurred in opening up some of their mains in consequence of the Council having laid them at a much greater depth than before, under the circumstances set forth in the "JOURNAL" last week (p. 51), was adopted without debate.

Improved Public Lighting at Hendon.—At the last meeting of the Hendon Urban District Council, the Works Committee reported having had under consideration a special report from the Surveyor as to a tender from the Gaslight and Coke Company for public lighting, including the special lighting at Cricklewood Broadway and West Hendon Broadway. The Committee recommended that the special lighting should be carried out upon the terms offered by the Company; also that three additional lamps should be fixed. Mr. Hearne said the effect of this recommendation would be to increase the illumination by 100 per cent. at an additional cost of 5 per cent. The recommendation was agreed to.

Gas and Electricity Charges at Nottingham.—At the meeting of the Nottingham City Council on Monday last week, the Town Clerk (Mr. J. A. H. Green) stated that he had received a communication from the Secretary of the Nottingham Association of Drapers and Allied Trades enclosing the following resolution passed at a meeting of their Committee and at a general meeting: "That this meeting is of opinion that the prices charged for electricity and gas in the city of Nottingham are excessive and unreasonable; and the meeting considers it unfair that local traders should be charged such prices in order that a contribution to the rates may be made. The meeting further suggests that an inquiry should be made into the general working and charges." The letter, as well as others received from the Boot and Leather Trades Association and the Nottinghamshire and Derbyshire Traders' Association, was referred to the General Purposes Committee.

Ashborne District Council and the Gas Company's Bill.—An extraordinary meeting of the Ashborne District Council was held on Monday last week to receive the report of the Committee appointed to deal with the Gas Company's Bill. The Committee stated that they had watched the progress of the Bill while it was before the Committee of the House of Lords, and had succeeded in obtaining a reduction of the standard price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet, of the dividend from 10 to 8 per cent., and of the borrowing powers from £20,000 to £15,000. Mr. Bamford (who read the report) strongly urged the Council to approach the Company, with a view of obtaining a purchase clause, and failing this to petition the House of Commons. He moved a resolution to this effect. Mr. Osborne criticized the action of the Committee, and urged that they could have obtained more concessions from the Company if they had met them in a proper spirit, and not pressed their opposition. He moved an amendment that the Council incur no further expense. On being put to the vote, however, only two supported it; while all the rest of the Council, with one exception, supported the resolution, which was carried.

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Concessions to Large Consumers of Gas in Manchester.—Details are now available of the concessions made by the Gas Committee of the Manchester Corporation to large consumers of gas. In the case of two firms, the charge will be 1s. 9d. per 1000 cubic feet for gas used for heating purposes, and for tyre furnaces, blow pipes, &c., provided the consumption is not less than 5 million and 1 million cubic feet per annum in the respective cases. It has also been decided that on and after the 25th of June next the price of gas within the city for manufacturing purposes other than illumination shall be 2s. per 1000 cubic feet, provided the annual consumption is not below 500,000 feet.

The Proposal to Disfranchise Municipal Employees.—When the Manchester City Council adjourned on Wednesday, Mr. Burgess's motion aiming at the disfranchisement of municipal employees because in certain wards their votes have a deciding influence in municipal elections, to which reference was made last week (p. 60), had not been reached. Reference was made to the resolution at the opening of the day's proceedings. When the Lord Mayor took the chair, Mr. Phillips said he considered that the members of the Council and the officials had been insulted by the motion. Alderman Holt submitted that Mr. Phillips was not in order in referring to the resolution until it came up for discussion in the ordinary way; and the Lord Mayor ruled that this was so.

West Gloucestershire Water Company.—Moving the adoption of the report at the recent annual meeting of the West Gloucestershire Water Company, the Chairman (Mr. Philip Fussell) said the trading of the past year had not been marked by any special feature, though on the whole there had been steady progress. The amount received for water supplied and for rents of property was approximately £11,700; the other items, making up a total of £12,031, were fluctuating. The balance available for distribution was £5918. An interim dividend at the rate of 3 per cent. per annum was paid on the 1st of October last; and out of the balance the Directors recommended the declaration of a final dividend (less income-tax) at the rate of 3½ per cent. per annum upon the 10 per cent. maximum shares, and £2 9s. upon the 7 per cent. maximum shares. Mr. H. Marten seconded the motion; and it was carried without discussion.

Gas Consumption in Belfast.—In the minutes of the Gas Committee of the Council of the County Borough of Belfast which were presented at the monthly meeting on Monday last week, there was a statement by the Gas Manager (Mr. J. D. Smith) in regard to the output of gas. From April 1, 1910, to March 23, 1911, it was 2,233,610,000 cubic feet, compared with 2,193,396,000 cubic feet for the corresponding period of 1909-10; being an increase of 40,214,000 cubic feet. Alderman Craig, in moving the adoption of the minutes, said the output of gas had been almost 2 per cent. in excess of that of the previous year. A member of the Council had asked him for particulars in reference to their meters. The stock of meters on March 31, 1910, was as follows: Fixed with consumers, 50,781; cost, £103,539, written-down to £48,423. In store, 5029 meters; cost, £12,896, written-down to £6030. Total, 55,810 meters; cost, £116,435, written-down to £54,453. It would be observed from these figures that the cost of meters had been written down by more than 53 per cent. The minutes were passed.

Swansea Gas Company.—The annual meeting of this Company was held last Saturday—Mr. John Glasbrook presiding. In moving the adoption of the report, the Chairman commented upon the satisfactory business of the Company and the continued increase in the quantity of gas sold. They had, as the shareholders were aware, applied to Parliament for an Act for additional capital and further powers to enable them to meet the demands made upon them. He regretted that opposition had been offered by the Corporation and others to the Bill, as whatever expense the Company were put to must of necessity fall upon the gas consumers. Further, the Bill was bound to go forward, because the Company wanted additional capital in order to meet the requirements of the town. The report was adopted, and the usual resolutions were passed with regard to the payment of dividend (5 per cent.). On the same day, Mr. E. Leeder sold by auction £8850 of the Company's new ordinary stock (5 per cent.), and £8450 of 4 per cent. perpetual debenture stock; the former at from £114 to £115, and the greater part of the latter at £102 10s., per £100 of stock.

Rochdale Corporation Gas Finances.—When the minutes of the Gas Committee were brought forward for confirmation at last Thursday's meeting of the Rochdale Town Council, Mr. Davidson inquired what the saving would be on the coal contracts for the ensuing year, and whether, in view of the fact that during the last twenty years a sum of £211,000 had been handed over from the profits made by the department for the relief of rates, the Committee would consider the question of reducing the price to consumers. He pointed out that the amount allocated in relief of the rates and the cost of gas supplied for street lighting during the past thirteen years made an amount approaching the total capital outlay on the works; and this being so, he submitted that consumers were entitled to some consideration. A further question was put by Mr. Blomley as to the profit made by the Gas Department during the past financial year. The Chairman of the Gas Committee (Mr. Walker) said the saving on the coal contracts for next year would be £750. The result of the past year's trading was not yet available. He promised that the question of price would be considered by the Committee at an early date.

The Gas Committee of the Manchester Corporation have appointed a Sub-Committee to consider and fix a scale of allowances to be made in cases of men in the employ of the department who die or become incapacitated after long and faithful service.

The Gas Committee of the Salford Corporation have approved of the recommendation of the Works Sub-Committee that the men employed in connection with the fixing of gas meters and appliances be put on a 48-hour week; the uniform rate of pay to be 8½d. an hour.

The Board of Trade Correspondent at Singapore reports that the Penang Municipal Commissioners intend improving the water supply of the place, at a cost of £17,000, of which amount between £5000 and £6000 will be spent on imported materials, consisting mainly of large cast-iron pipes and other ironwork.

Census, 1911.

. . THE . .

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TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending April 8. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar crude	per ton	—	18/9 21/6	18/6 22/-	19/- 21/-	18/6 21/-	—
Pitch	,,	37/-	35/6 36/-	35/9	36/6	35/6	35/6
Benzol, 90%	per gallon	-/10	-/9	-/9	-/9	-/9	-/9
Benzol, 50-90%	,,	-/10½	-/9¼	-/9½	-/8¼ -/8½	-/8⅝	—
Toluol, 90%	,,	—	-/9⅜	-/10	-/10	-/10	-/10
Crude naphtha, 30%	,,	—	-/3¾	-/4	-/3½ -/3⅝	-/3⅜ -/3¾	—
Light oil, 50%	,,	—	-/3½	-/3⅜ -/4	-/3 -/3⅛	-/3¼ -/3⅜	—
Solvent naphtha, 90-160	,,	—	-/10½ -/11	-/10	-/10	-/10½	-/11
Heavy naphtha, 90-190	,,	—	-/11	-/11½	-/11	-/11 -/11½	-/11
Creosote in bulk	,,	-/2½ -/2⅝	-/2 -/2¼	-/2	-/2 -/2¼	-/2½	-/1⅞
Heavy oils	,,	—	-/2½ -/3	-/2¼	-/2¾	-/2¾	-/2⅜
Carbolic Acid, 60's	,,	—	1/8	1/7	1/7 1/7½	1/7½	1/8½
Naphthalene, crude drained salts	per ton	—	42/6 45/-	40/- 42/6	45/-	46/3	—
,, pressed	,,	—	60/-	63/-	58/9	60/- 72/6	—
,, whizzed	,,	—	—	—	71/3	60/- 75/-	63/-
Anthracene	per unit	-/2	-/1⅜	-/1½	-/1¼	-/1¼	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER. Brecon Gas Company.
DRAUGHTSMAN (LEADING). No. 5381.
DRAUGHTSMAN. Clayton, Son, and Co., Leeds.
DRAUGHTSMAN. No. 5380.
DRAUGHTSMAN. 2576, c.o. Burtons, Aldwych, W.C.
TRAVELLER. No. 5361.
RENTAL CLERK (Gas and Water). No. 5379.
COLLECTOR (Gas and Water). No. 5379.
MAN EXPERIENCED IN HIGH PRESSURE GAS HEATED APPLIANCES. No. 5371.
SHOW ROOM ATTENDANT. Longwood Gas Company. Applications by April 15.
FITTER. No. 5378.

Situation, &c., Wanted.

SULPHATE PLANT REPAIRER, &c. Davies, Shepherd's Bush.

Pupil Wanted.

No. 5373.

Plant, &c. (Second-Hand), For Sale.

BRIDGE PIPES, &c., MOUTHPIECES, GASHOLDER, &c. Adams and Sons, Newcastle-on-Tyne.
HIGH PRESSURE LIGHTING PLANT. Hereford Gas Works.

Plant, &c. (Second-Hand), For Sale (*continued*)—

PUMPS. W. Johnson, Jun., New Hythe.
PURIFIERS, &c. R. & J. Dempster, Limited, Manchester.
ROVER CAR. South Bank Gas Works.
SLOT-COOKERS. No. 5375.

Meeting.

IMPERIAL CONTINENTAL GAS ASSOCIATION. Cannon Street Hotel, May 2. 2.30 o'clock.

Stocks and Shares.

ASCOT DISTRICT GAS AND ELECTRICITY COMPANY. By Auction. April 25.
CHERTSEY GAS COMPANY. By Auction. April 25.
LEATHERHEAD WATER COMPANY. By Tender. April 24.
LIMPSFIELD AND OXTED WATER COMPANY. By Auction. April 25.
SOUTH ESSEX WATER COMPANY. By Auction. April 25.
WHITCHURCH AND DISTRICT GAS COMPANY. By Auction. April 25.

TENDERS FOR

Benzol.

BRIDGEWATER COKE-OVEN WORKS. Tenders by April 22.

Coal and Cannel.

BLACKPOOL GAS COMMITTEE. Tenders by April 22.
ISLE OF THANET GASLIGHT COMPANY. Tenders by April 19.
RHYL URBAN DISTRICT COUNCIL. Tenders by April 25.
SHREWSBURY GASLIGHT COMPANY. Tenders by April 21.
TORQUAY GAS-WORKS COMMITTEE. Tenders by April 24.

Excavating and Main Laying.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by May 1.

Lime.

LEEDS GAS DEPARTMENT. Tenders by April 22.

Pipes, &c.

BAKEWELL URBAN DISTRICT COUNCIL. Tenders by May 1.
LEEDS GAS DEPARTMENT. Tenders by April 22.

Retort Castings.

LEEDS GAS DEPARMENT. Tenders by April 22.

Tar and Liquor.

RHYL URBAN DISTRICT COUNCIL. Tenders by May 20.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 94.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Oct. 14	5	Alliance & Dublin Ord.	84—87	..	5 14 11
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	95—97	−1	4 2 6
200,000	5	Oct. 28	7	Bombay, Ltd.	6¼—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	5¼—5⅞	..	4 17 5
50,000	10	Feb. 24	15	Bourne-mouth Gas & Water { B 7 p.c. / Pref. 6 p.c.	28—29	..	5 3 5
311,810	10	,,	7		16—16½	..	4 4 10
75,000	10	,,	6		14½—15	..	4 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	252—255	..	4 18 1
330,000	,,	,,	9½	Do. New	197—200	..	4 15 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	98—100	..	4 0 0
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	215—218	..	5 0 11
246,320	,,	,,	8	Do. A Ord. Stk.	155—158	..	5 1 3
460,000	20	Sept. 29	10⅝	British	44½—45½	..	4 13 6
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	96—98	..	4 1 8
109,000	,,	Feb. 10	6	Bromley, A 5 p.c.	116—118	..	5 1 8
165,700	,,	,,	4½	Do. B 3½ p.c.	87—89	..	5 1 2
82,278	,,	,,	5½	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb.	84—86	..	4 1 5
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	96—98	..	4 1 8
100,000	10	—	—	Cape Town & Dis., Ltd.	3½—4½	..	—
100,000	10	—	—	Do. 4½ p.c. Pref.	6—6½	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88—90	..	5 0 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,513,280	Stk.	,,	5/9/4	Commercial 4 p.c. Stk.	113—116	..	4 14 3
560,000	,,	,,	5½	Do. 3½ p.c. do.	108—110	..	4 16 11
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77—79	..	3 15 11
800,000	Stk.	,,	4	Continental Union, Ltd.	95—97	..	4 2 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—138	..	5 1 5
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
148,995	,,	Oct. 14	5	East Hull 5 p.c. Ord.	103—105	..	4 15 3
840,150	10	Jan. 27	10	European, Ltd.	19½—20½	..	4 17 7
16,179,445	Stk.	Feb. 24	4⅜	Gas-light and Coke { 4 p.c. Ord. / 3½ p.c. max. / 4 p.c. Con. Pref. / 3 p.c. Con. Deb.	105½—106½	..	4 7 7
2,600,000	,,	,,	3½		85—87	..	4 0 6
4,062,235	,,	,,	4		101—103	..	3 17 8
4,531,705	,,	Dec. 15	3		79—81	..	3 14 1
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	92—94	..	5 6 5
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Oct. 14	11	Hongkong & China, Ltd.	17⅝—18	..	6 2 3
131,000	Stk.	Mar. 10	7⅞	Ilford A and C	143—146	..	5 1 0
65,780	,,	,,	5⅝	Do. B	113—115	..	5 2 2
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	96—98	..	4 1 8

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	Nov. 11	9	Imperial Continental	191—193	..	4 13 3
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	119—121	..	4 19 2
561,000	Stk.	Feb. 24	10	Liverpool United A.	214—216	..	4 12 7
718,100	,,	,,	7	Do. B.	161½—163½	..	4 5 8
306,083	,,	Dec. 30	4	Do. Deb. Stk.	102·—104½	..	3 16 7
75,000	5	Dec. 15	6	Malta & Mediterranean	4¾—5	..	6 0 0
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	100—102*	..	4 18 0
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	100—102*	..	4 8 3
541,920	20	Nov. 11	3½	Monte Video, Ltd.	13—13½	..	5 3 8
1,775,892	Stk.	Feb. 24	4½	Newc'tle&G'tesh'd Con.	100½—101½	..	4 6 2
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	89—90	..	3 17 9
55,940	10	Mar. 10	7	North Middlesex 7 p.c.	14½—15½	..	4 10 4
300,000	Stk.	Nov. 30	8	Oriental, Ltd.	139—141	..	5 13 6
60,000	5	Sept. 15	8	Ottoman, Ltd.	7—7½	..	5 6 8
31,800	53	Feb. 24	13	Portsea Island A	135—140	..	4 18 4
60,000	50	,,	13	Do. B	125—130	..	5 0 0
100,000	50	,,	12	Do. C	120—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	102—105	..	4 15 3
398,490	5	Oct. 28	7	Primitiva Ord.	7⅞—8	..	4 7 6
796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5½—5¾	..	4 10 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mar. 24	9	San Paulo, Ltd.	15½—16*	..	5 12 6
115,000	10	,,	6	Do. 6 p.c. Pref.	11½—12*	..	5 0 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Mar. 24	10	Sheffield A	234—236*	+2	4 4 9
209,984	,,	,,	10	Do. B	234—236*	+2	4 4 9
523,500	,,	,,	10	Do. C	234—236*	+2	4 4 9
70,000	10	Oct. 14	6	South African	10½—11	..	5 9 1
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	79—81	..	3 14 1
209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	153—155	..	5 3 3
605,000	Stk.	Feb. 24	5⅜	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 13 6
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	122—124	..	4 0 8
502,310	Stk.	Nov. 11	5	Southampton Ord.	111—113	..	4 8 6
120,000	Stk.	Feb. 10	7	Tottenham A 5 p.c. and B 3½ p.c.	141—143	..	4 17 11
483,940	,,	,,	5½		115—117	..	4 14 0
149,470	,,	Dec. 15	4	Edmonton 4 p.c. Deb.	98—100	..	4 0 0
182,380	10	Dec. 30	8	Tuscan, Ltd.	9—9½	..	8 8 6
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	112—113	..	4 8 6
255,636	Stk.	Feb. 24	6⅔	Wands- B 3½ p.c.	141—143	..	4 14 5
85,766	,,	Dec. 30	3	worth 3 p.c. Deb. Stk.	73—75	..	4 0 0

Prices marked * are "Ex. div."

The Houses of Parliament Press Gallery tea-rooms are to be fitted with gas-heated water-boiling apparatus; and Messrs. R. & A. Main, Limited, have been successful in securing the order.

Winners of the four leagues in connection with the Metropolitan Industrial Rifle Association met on Saturday afternoon at the Bromley-by-Bow Gas-Works to decide the championship. In the semi-final round, Beckton Gas-Works beat the "Daily Telegraph" Rifle Club first team by 778 to 773; and Pearson's accounted for the "Daily Telegraph" B team by 751 to the latter's 746. Beckton won the final—beating Pearson's by 777 to 760.

At the North London Police Court last Wednesday, Andrew Hillery, 37, was committed for trial on several charges of stealing money from prepayment meters. It was stated that the accused wore a cap similar in shape to those used by men in the employ of the prosecuting Companies. He called at consumers' houses, and told the occupiers that he was an official of the particular Company, and wished to examine the meter. He then stole the money in the boxes.

The firm of Messrs. J. W. & C. J. Phillips, of College Hill, E.C., who are known to many readers of the "JOURNAL" as makers of recording gauges. thermometers, pyrometers, &c., has been converted into a limited liability Company, with a capital of £15,000, in £1 shares (4000 of them being preference), to carry on the business of mechanical engineers.

As the result of the joint action of the Directors of the Elsecar Gas Company and the Vulcan Stove Company, Limited, of London and Birmingham, exhibitions of gas cooking and heating stoves have lately been held in the Hoyland Town Hall and the Elsecar Market Hall, in connection with which demonstrations in cookery were given by Mrs. Godfrey Sutcliffe, of London. During the exhibition, a number of friends were asked to dine with the Directors, one of the objects being to dissipate the notion that food cooked in gas-ovens tastes of gas. The function was eminently successful in its purpose. The Directors took advantage of the occasion to demonstrate the possibilities of gas lighting; the old fittings of the Town Hall being replaced by modern high-power gas-lamps, with a surprising effect.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EASTER HOLIDAYS.

In consequence of the EASTER HOLIDAYS, all Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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